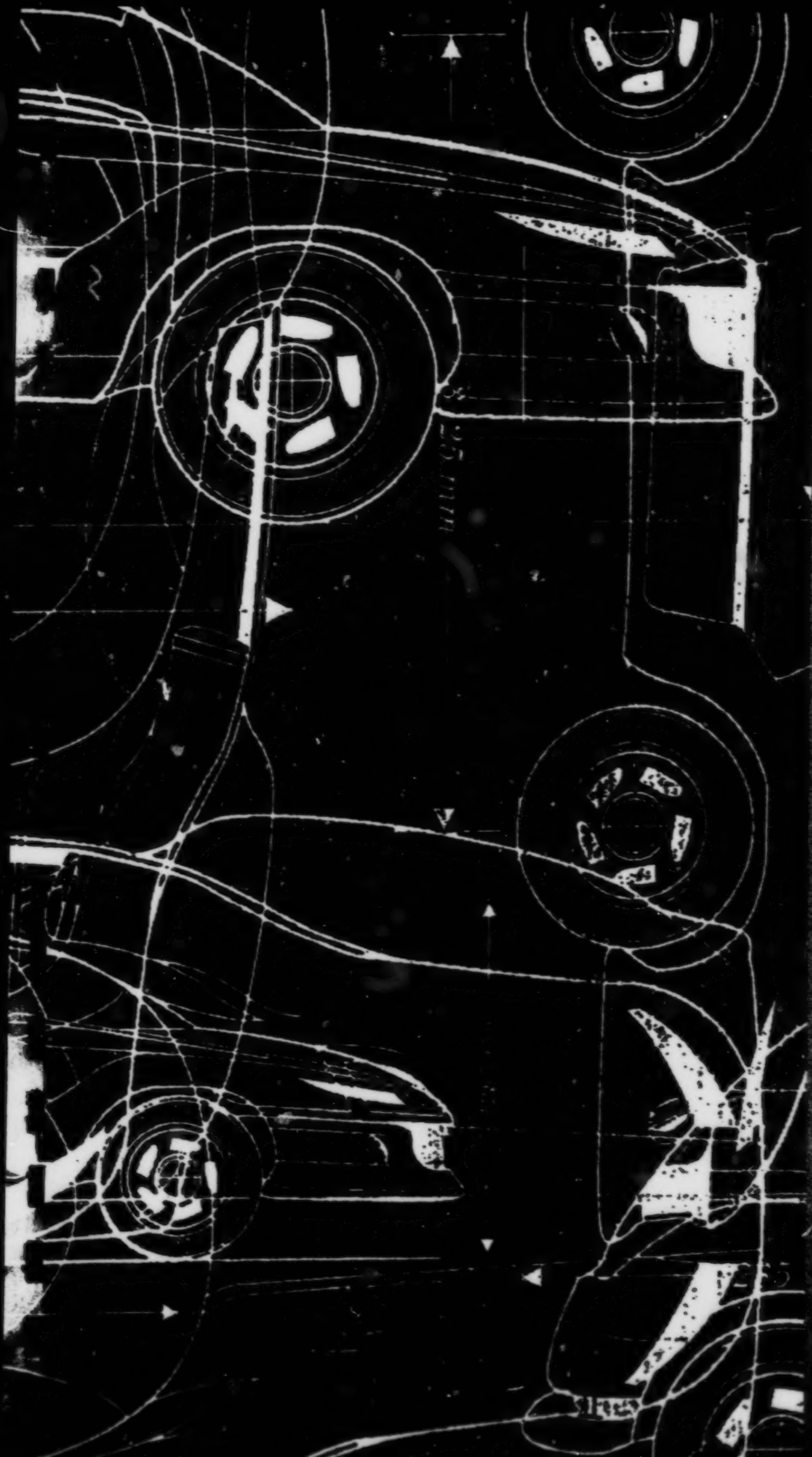

Automotive
Research
and
Development
Capability in
Canada

Automotive Research and Development Capability in Canada

Automotive Directorate
Surface Transportation and Machinery Branch
Industry, Science and Technology Canada
January 1991

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Introduction

The automotive industry is an important producer of wealth in Canada. It accounts for 15 percent of total manufacturing shipments and 27 percent of Canadian merchandise exports. Increasing global competition requires that we supply high quality, technologically superior parts at competitive prices. Canadian automotive industry producers need to devote more resources to R&D and product development to remain competitive.

Automotive Research and Development Capability in Canada presents information on the capabilities of organizations conducting automotive R&D. Directory users can learn who in Canada is performing R&D in a specific technology area, applicable to a distinct vehicle type or particular manufacturing process. The directory can also be used as a networking tool to encourage joint venturing and other forms of cooperation among companies, academia, government laboratories, technology centres and consultants.

In the body of the directory, responding organizations have rated their R&D capability in various technical areas of expertise on a scale from 0 to 10, with 10 indicating highest capability. Note that these ratings are subjective.

The directory is based on a survey of over 500 organizations. Participation in the survey was voluntary. Many organizations known to have automotive R&D capability failed to respond, and were therefore not included.

Further information regarding R&D in Canada is available from many sources. Industry, Science and Technology Canada's *B.O.S.S. Directory of Research and Development Laboratories/Facilities in Canada* (March 1990) is a major source. Another is the Government of Quebec's *La recherche scientifique et le développement expérimental au Québec* (répertoire 1987-1988).

Automotive Research and Development Capability in Canada was produced by MacLennan Associates under contract to Industry, Science and Technology Canada.

Table of Contents

ABC Group 1
Acadia University 2
Acustar Canada Inc.
  Ajax Trim Division 3
Annectron Engineering Inc. 4
Biokinetics and Associates Ltd. 5
CADMI Microelectronics/microélectronique Inc. 6
Canadian General-Tower Limited 7
Canadian Institute of Industrial Technology
  Division of Electrical Engineering 8
Carleton University 9
Carleton University
  School of Industrial Design 10
Cartech Consulting Services 11
Centre de consultation et de formation en automatique et ordinique (CFAO) 12
Centre de recherche industrielle du Québec (CRIQ) 13
Centre spécialisé de technologie physique 14
Circo Craft 15
Command Start Inc. 16
Composite Technological Materials Centre 17
Concordia University
  CONCAVE Research Centre 18
Concordia University
  Department of Mechanical Engineering 19
Concordia University
  Science Industrial Research Unit 20
DBM Reflex Entreprise Inc. 21
DSMA International Inc. 22
Defence and Civil Institute of Environmental Medicine
  Biodynamics Group 23
Diffracto Limited 24
Eberhard Hardware Manufacturing Limited 25
École Polytechnique de Montréal 26
École Polytechnique de Montréal
  Centre de caractérisation microscopique des matériaux 27
École Polytechnique de Montréal
  Centre de recherche appliquée sur les polymères (CRASP) 28
Environment Canada
  Vehicle Emissions Test Laboratory 29
F.E.L. Consultants Limited 30
F.T. Gerson Limited 31
Fiberglas Canada Inc. 32
Forensic Engineering 33
Forming Technologies Incorporated 34
Gad Shaanan Designs Inc. 35
Gates Power Drive Products Inc. 36

General Kinetics Engineering Corp. 37
Global Sensor Systems Inc 38
Glos Engineering Ltd. 39
Goshen Rubber of Canada Limited 40
Hawtal Whiting of Canada Ltd. 41
Hematite Manufacturing 42
Hoemsen & Associates 43
Holland College Technology Centre 44
Hugh Macmillan Rehabilitation Centre
  Rehabilitation Engineering 45
Hydro-Québec
  Laboratoire des technologies électrochimiques/électrotechniques 46
Hydro-Québec Research Institute 47
IPL Inc. 48
Ingenious Devices Ltd. 49
Ingersoll-Rand Canada Inc.
  Torrington Division 50
Institut d'ordinique du Québec 51
KTC Testing & Development Inc. 52
KVB Manufacturing 53
Lakehead University
  Department of Mechanical Engineering 54
Long Manufacturing Ltd. 55
METCOR Inc. 56
MacLennan Associates 57
Magna International 58
Management of Technology and Innovation Institute 59
Manufacturing Research Corporation of Ontario 60
McGill University
  CSIRA Steel Processing Laboratory 61
McGill University
  Department of Mining and Metallurgical Engineering 62
McGill University
  Department of Metallurgical Engineering 63
McMaster University
  Centre for Flexible Manufacturing Research and Development 64
McMaster University
  Department of Mechanical Engineering 65
McMaster University
  Institute for Polymer Production 66
NARMCO National Auto Radiator Manufacturing Co. 67
National Institute of Magnesium Technology 68
National Optics Institute 69
National Research Council
  Environmental Protection Science 70

National Research Council
  Industrial Materials Research Institute 71
Northern Alberta Institute of Technology 72
ORTECH International 73
Ontario Centre for Materials Research 74
Pavaco Plastics Inc. 75
Protrans Design Team 76
Queen's University
  Department of Chemistry 77
Queen's University
  Department of Mechanical Engineering 78
Queen's University
  Department of Metallurgical Engineering 79
Rockwell International of Canada Ltd. 80
Rutenberg Design Inc. 81
Ryerson Polytechnical Institute
  Office of Research and Innovation 82
SKD Company 83
Sambrook & Hermetz Industrial Designers 84
Sensor Adaptive Machines Inc. (SAMI) 85
Siemens Automotive Ltd.
  Induction/Cooling Division 86
Simon Fraser University
  School of Engineering Science 87
Société de Microélectronique Industrielle de Sherbrooke Inc. 88
Southern Alberta Institute of Technology
  Auto-Diesel Department 89
Spectrum Engineering Corporation Ltd. 90
Stelco Inc. 91
TAVA Corporation 92
TES Limited 93
Technical University of Nova Scotia
  Department of Mechanical Engineering 94
The University of British Columbia
  Department of Electrical Engineering 95
The University of British Columbia
  Department of Mechanical Engineering 96
The University of Western Ontario
  Surface Science Western 97
Thermotech Engineering 98
Transport Canada
  Motor Vehicle Test Centre 99
Uniroyal Goodrich 100
Université Laval
  CERSIM 101

Université Laval
Department of Mechanical Engineering 102
Université Laval
LIPAO, Department of Chemical Engineering 103
Université de Sherbrooke
Acoustics Group (GAUS) 104
University of New Brunswick
Manufacturing Technology Centre 105
University of Ottawa 106
University of Ottawa
Department of Mechanical Engineering 107
University of Ottawa
Electrochemical Science and Technology Centre 108
University of Toronto
Department of Chemical Engineering and Applied Chemistry 109
University of Toronto
Department of Chemical Engineering and Applied Chemistry 110
University of Toronto
Department of Electrical Engineering, VLSI Research Group 111
University of Toronto
Department of Mechanical Engineering 112
University of Toronto
Department of Mechanical Engineering, CIM Laboratory 113
University of Toronto
Department of Mechanical Engineering, Engine R&D Laboratory 114
University of Toronto
Department of Metallurgy and Materials Science 115
University of Toronto
Department of Mechanical Engineering, Robotics and Automation Laboratory ... 116
University of Toronto
Faculty of Applied Science and Engineering 117
University of Toronto
Institute of Aerospace Studies 118
University of Waterloo
Institute for Improvement of Quality and Productivity 119
Vancouver Community College
Career Division 120
Vehicle Systems Development Corp. 121
W.R. Davis Engineering Limited 122
WEGU Canada Inc. 123
Weir-Jones Engineering Consultants Ltd. 124
Wilson, Dario & Associates 125

ABC Group

100 Ronson Drive
Rexdale
ONT. M8W 1B6

Date of Response: May 23, 1990
Contact: Hugh Duffy
Title: Director, New Product Development
Phone: (416) 246-1782
Fax: (416) 246-1552

Organization Type

Government Laboratory	
Technology Centre	
Community College	
University	
Industrial Company	Yes
Other (including Consulting)	

Total Staffing

1-24 Employees	
25-99 Employees	
100-499 Employees	
500-999 Employees	
1 000+ Employees	Yes
Total Staff	1 600

R&D Staffing

Doctorate Level	1
Master's Level	1
Bachelor's Level	2
Technologists	2
Total R&D Staff	6

Type of R&D Performed

Research	Yes
Product Design	Yes
Manufacturing Processes	Yes
Industrial Engineering	
Plant and Env. Hazards Eng.	
Test and Evaluation	Yes

Vehicle Applicability

Alternate and Multifuel	
Electric and Hybrid	
Cars and Vans	Yes
Off-road Vehicles	
Trucks, Buses, Trailers	Yes
Specialty Vehicles	

Manufacturing Process Expertise

Metal Manufacturing Processes	2
Plastics Manufacturing Processes	10
Mfg. Machinery and Equipment	8
Robotics	8
Other Manufacturing Processes	8

Knowledge Specialty

Aero and Fluid Dynamics	
CAD, CAM, CIM	10
Finite Element Analysis	10
Fuels and Lubricants	
Ergonomics and Industrial Design	10
Joining and Fastening	
Materials: Ferrous Metals	
Materials: Non-ferrous Metals	
Materials: Plastics	10
Materials: Composites	10
Materials: Rubber	
Materials: Glass	
Materials: Electrical/Electronic	
Finishes and Coatings	
Noise and Vibration	7
Simulation and Modelling	
Stress/Strain/Stiffness	
Systems Integration	
Other	

Automotive Component Specialty

Body and Structure	
Electrical System	
Engines	
Emission Controls	
Heating, Ventilation and A/C	
Instruments and Controls	
Interior Trim and Components	
Steering, Suspension, Brakes	
Transmission	
Safety	
Wheels and Tires	
Diagnostic and Service Equipment	

Affiliations With Other Organizations

Nishikawa Kasei, Japan (Joint Venture). WOCO Industrietechnik, Germany (Joint Venture).

R&D Projects

None Reported.

Special R&D Facilities

Blow moulding machines, injection blow moulding. Co-extrusion, extruders for compounding. Injection moulding machines. Physical testing of plastics (tensile, elongation, flexural modulus, Izod impact, melt flow, Shore hardness, heat aging, freezer). Ash content, distortion temperature, Vicat softening, specific gravity. Floor Space Devoted to R&D: 900 m^2.

Acadia University

WOLFVILLE, N.S.
B0P 1X0

Date of Response: April 19, 1990
Contact: Dr. M.E. Peach
Title: Director, Graduate Studies and Research
Phone: (902) 542-2201
Fax: (902) 542-1412

Organization Type		**Total Staffing**		**R&D Staffing**
Government Laboratory		1-24 Employees		Doctorate Level
Technology Centre		25-99 Employees		Master's Level
Community College		100-499 Employees		Bachelor's Level
University	Yes	500-999 Employees	Yes	Technologists
Industrial Company		1 000+ Employees		Total R&D Staff
Other (including Consulting)		Total Staff		

Type of R&D Performed	**Vehicle Applicability**	**Manufacturing Process Expertise**
Research	Alternate and Multifuel	Metal Manufacturing Processes
Product Design	Electric and Hybrid	Plastics Manufacturing Processes
Manufacturing Processes	Cars and Vans	Mfg. Machinery and Equipment
Industrial Engineering	Off-road Vehicles	Robotics
Plant and Env. Hazards Eng.	Trucks, Buses, Trailers	Other Manufacturing Processes
Test and Evaluation	Specialty Vehicles	

Knowledge Specialty			**Automotive Component Specialty**	
Aero and Fluid Dynamics		Finishes and Coatings	Body and Structure	
CAD, CAM, CIM		Noise and Vibration	Electrical System	
Finite Element Analysis		Simulation and Modelling	Engines	
Fuels and Lubricants		Stress/Strain/Stiffness	Emission Controls	
Ergonomics and Industrial Design		Systems Integration	Heating, Ventilation and A/C	
Joining and Fastening		Other	Instruments and Controls	
Materials: Ferrous Metals			Interior Trim and Components	
Materials: Non-ferrous Metals			Steering, Suspension, Brakes	
Materials: Plastics			Transmission	
Materials: Composites			Safety	
Materials: Rubber	5		Wheels and Tires	5
Materials: Glass			Diagnostic and Service Equipment	
Materials: Electrical/Electronic				

Affiliations With Other Organizations
None Reported.

R&D Projects
None Reported.

Special R&D Facilities
No R&D capabilities applicable to automotive R&D except expertise in rubber. Floor Space Devoted to R&D: Not Reported.

Acustar Canada Inc.
Ajax Trim Division

274 Mackenzie Avenue
AJAX, Ont.
L1S 2E9

Date of Response: April 9, 1990
Contact: Uwe Schneider
Title: Manufacturing Engineering Manager
Phone: (416) 427-8925
Fax: (416) 427-8980

Organization Type

Government Laboratory	
Technology Centre	
Community College	
University	
Industrial Company	Yes
Other (including Consulting)	

Total Staffing

1-24 Employees	
25-99 Employees	
100-499 Employees	
500-999 Employees	
1 000+ Employees	Yes
Total Staff	1 800

R&D Staffing

Doctorate Level	
Master's Level	2
Bachelor's Level	3
Technologists	2
Total R&D Staff	8

Type of R&D Performed

Research	
Product Design	Yes
Manufacturing Processes	Yes
Industrial Engineering	
Plant and Env. Hazards Eng.	
Test and Evaluation	

Vehicle Applicability

Alternate and Multifuel	
Electric and Hybrid	
Cars and Vans	Yes
Off-road Vehicles	
Trucks, Buses, Trailers	
Specialty Vehicles	

Manufacturing Process Expertise

Metal Manufacturing Processes	2
Plastics Manufacturing Processes	5
Mfg. Machinery and Equipment	8
Robotics	5
Other Manufacturing Processes	

Knowledge Specialty

Aero and Fluid Dynamics	2	Finishes and Coatings	4
CAD, CAM, CIM	6	Noise and Vibration	6
Finite Element Analysis	3	Simulation and Modelling	5
Fuels and Lubricants	3	Stress/Strain/Stiffness	3
Ergonomics and Industrial Design	6	Systems Integration	6
Joining and Fastening	7	Other	
Materials: Ferrous Metals	3		
Materials: Non-ferrous Metals	3		
Materials: Plastics	7		
Materials: Composites	7		
Materials: Rubber	6		
Materials: Glass			
Materials: Electrical/Electronic	4		

Automotive Component Specialty

Body and Structure	4
Electrical System	4
Engines	
Emission Controls	
Heating, Ventilation and A/C	5
Instruments and Controls	5
Interior Trim and Components	10
Steering, Suspension, Brakes	
Transmission	
Safety	4
Wheels and Tires	
Diagnostic and Service Equipment	

Affiliations With Other Organizations
State-of-the-art R&D facilities at Acustar HQ. Chrysler Canada and Chrysler Corp. License from Italy to use Woodstock process to mould trim panels.

R&D Projects
Develop methods to sew together seat covers. Develop material bonding processes (cut-and-seal, dielectric, ultrasonics and others). Develop patterns using computerized marking system (realizing maximum material utilization). Develop material to mould 3D trim panels — doors, package trays, etc.

Special R&D Facilities
State-of-the-art special sewing machines. Patented multi-needle sewing machine and cut-and-seal machine. State-of-the-art computerized cutting system. Ultramodern manufacturing facilities to mould, cover and finish 3-D door trim panels. Floor Space Devoted to R&D: Not Reported.

Annectron Engineering Inc.

P.O. Box 13312
KANATA, Ont.
K2K 1X5

Date of Response: June 5, 1990
Contact: **Ron Price, M.Eng., P.Eng.**
Title: **President**
Phone: **(613) 257-8083**

Organization Type	
Government Laboratory	
Technology Centre	
Community College	
University	
Industrial Company	
Other (including Consulting)	Yes

Total Staffing	
1-24 Employees	Yes
25-99 Employees	
100-499 Employees	
500-999 Employees	
1 000+ Employees	
Total Staff	3

R&D Staffing	
Doctorate Level	
Master's Level	1
Bachelor's Level	1
Technologists	1
Total R&D Staff	3

Type of R&D Performed	
Research	
Product Design	Yes
Manufacturing Processes	
Industrial Engineering	
Plant and Env. Hazards Eng.	
Test and Evaluation	Yes

Vehicle Applicability	
Alternate and Multifuel	Yes
Electric and Hybrid	Yes
Cars and Vans	Yes
Off-road Vehicles	Yes
Trucks, Buses, Trailers	Yes
Specialty Vehicles	Yes

Manufacturing Process Expertise	
Metal Manufacturing Processes	5
Plastics Manufacturing Processes	6
Mfg. Machinery and Equipment	3
Robotics	
Other Manufacturing Processes	

Knowledge Specialty	
Aero and Fluid Dynamics	8
CAD, CAM, CIM	8
Finite Element Analysis	8
Fuels and Lubricants	3
Ergonomics and Industrial Design	5
Joining and Fastening	7
Materials: Ferrous Metals	9
Materials: Non-ferrous Metals	9
Materials: Plastics	9
Materials: Composites	9
Materials: Rubber	6
Materials: Glass	2
Materials: Electrical/Electronic	2
Finishes and Coatings	5
Noise and Vibration	7
Simulation and Modelling	4
Stress/Strain/Stiffness	10
Systems Integration	9
Other	

Automotive Component Specialty	
Body and Structure	5
Electrical System	3
Engines	3
Emission Controls	
Heating, Ventilation and A/C	6
Instruments and Controls	4
Interior Trim and Components	2
Steering, Suspension, Brakes	6
Transmission	4
Safety	6
Wheels and Tires	
Diagnostic and Service Equipment	

Affiliations With Other Organizations

None Reported.

R&D Projects

Mechanical engineering of electronics equipment, including thermal analysis. Fatigue design. CAD including drawing capture. Technology assessment. Project management. Documentation including test procedures.

Special R&D Facilities

Model shop with machine tools. Extensive CAD facilities. Finite element analysis software for mechanical and thermal applications. Extensive technical library. Floor Space Devoted to R&D: 30 m^2.

Biokinetics and Associates Ltd.

1481 Cyrville Road
OTTAWA, Ont.
K1B 3L7

Date of Response: May 11, 1990
Contact: James A. Newman
Title: President
Phone: (613) 744-1073
Fax: (613) 744-1701

Organization Type

Government Laboratory	
Technology Centre	
Community College	
University	
Industrial Company	
Other (including Consulting)	Yes

Total Staffing

1-24 Employees	Yes
25-99 Employees	
100-499 Employees	
500-999 Employees	
1 000 + Employees	
Total Staff	

R&D Staffing

Doctorate Level	2
Master's Level	1
Bachelor's Level	4
Technologists	
Total R&D Staff	7

Type of R&D Performed

Research	Yes
Product Design	Yes
Manufacturing Processes	
Industrial Engineering	
Plant and Env. Hazards Eng.	
Test and Evaluation	Yes

Vehicle Applicability

Alternate and Multifuel	
Electric and Hybrid	
Cars and Vans	
Off-road Vehicles	Yes
Trucks, Buses, Trailers	
Specialty Vehicles	Yes

Manufacturing Process Expertise

Metal Manufacturing Processes	
Plastics Manufacturing Processes	2
Mfg. Machinery and Equipment	2
Robotics	2
Other Manufacturing Processes	

Knowledge Specialty

Aero and Fluid Dynamics	4
CAD, CAM, CIM	6
Finite Element Analysis	5
Fuels and Lubricants	2
Ergonomics and Industrial Design	8
Joining and Fastening	1
Materials: Ferrous Metals	3
Materials: Non-ferrous Metals	3
Materials: Plastics	5
Materials: Composites	7
Materials: Rubber	2
Materials: Glass	1
Materials: Electrical/Electronic	4
Finishes and Coatings	3
Noise and Vibration	4
Simulation and Modelling	9
Stress/Strain/Stiffness	7
Systems Integration	7
Other	

Automotive Component Specialty

Body and Structure	1
Electrical System	1
Engines	2
Emission Controls	1
Heating, Ventilation and A/C	1
Instruments and Controls	3
Interior Trim and Components	1
Steering, Suspension, Brakes	1
Transmission	1
Safety	10
Wheels and Tires	1
Diagnostic and Service Equipment	1

Affiliations With Other Organizations

CSA, ISO, APEO, ASME, SAE, AAAM.

R&D Projects

Seat belt deployment test device. Facial injury surrogate. Head injury criteria development. Motorcyclist anthropomorphic test device. Air bag induced neck injuries.

Special R&D Facilities

Helmet test facility. Occupant crash victim simulator. Ultrasonic 3-D digitizer. Anthropometric facilities. Floor Space Devoted to R&D: 500 m^2.

CADMI Microelectronics/microélectronique Inc.

Room 105, Head Hall, UNB Campus
FREDERICTON, N.B.
E3B 5A3

Date of Response: March 20, 1990
Contact: Gary Bouzanne
Title: Engineering Manager
Phone: (506) 453-3556
Fax: (506) 453-4599

Organization Type	
Government Laboratory	
Technology Centre	Yes
Community College	
University	
Industrial Company	
Other (including Consulting)	

Total Staffing	
1-24 Employees	Yes
25-99 Employees	
100-499 Employees	
500-999 Employees	
1 000+ Employees	
Total Staff	8

R&D Staffing	
Doctorate Level	1
Master's Level	2
Bachelor's Level	2
Technologists	2
Total R&D Staff	7

Type of R&D Performed	
Research	Yes
Product Design	Yes
Manufacturing Processes	
Industrial Engineering	
Plant and Env. Hazards Eng.	
Test and Evaluation	

Vehicle Applicability	
Alternate and Multifuel	Yes
Electric and Hybrid	Yes
Cars and Vans	Yes
Off-road Vehicles	Yes
Trucks, Buses, Trailers	Yes
Specialty Vehicles	Yes

Manufacturing Process Expertise	
Metal Manufacturing Processes	
Plastics Manufacturing Processes	
Mfg. Machinery and Equipment	
Robotics	10
Other Manufacturing Processes	

Knowledge Specialty			
Aero and Fluid Dynamics		Finishes and Coatings	
CAD, CAM, CIM	9	Noise and Vibration	
Finite Element Analysis		Simulation and Modelling	8
Fuels and Lubricants		Stress/Strain/Stiffness	
Ergonomics and Industrial Design		Systems Integration	
Joining and Fastening		Other	
Materials: Ferrous Metals			
Materials: Non-ferrous Metals			
Materials: Plastics			
Materials: Composites			
Materials: Rubber			
Materials: Glass			
Materials: Electrical/Electronic	10		

Automotive Component Specialty	
Body and Structure	
Electrical System	10
Engines	
Emission Controls	
Heating, Ventilation and A/C	7
Instruments and Controls	9
Interior Trim and Components	
Steering, Suspension, Brakes	
Transmission	
Safety	
Wheels and Tires	
Diagnostic and Service Equipment	8

Affiliations With Other Organizations

Manufacturing Technology Centre (MTC) of University of New Brunswick — mechanical CAD design.

R&D Projects

Mobile data logging system for recording vehicle motion and controls. Mobile data logging system to measure forces on the blades of a plough. Controller for combination wood/oil-burning furnace. Computer vision system to measure lumber.

Special R&D Facilities

Network of Sun workstations running Workview, a $400 000 electronic circuit simulation package. Two workstations running PCAD for printed circuit board layout and design. Full range of lab test equipment for electronics prototype testing. Floor Space Devoted to R&D: Not Reported.

Canadian General-Tower Limited

52 Middleton St.
P.O. Box 160
CAMBRIDGE, Ont.
N1R 5T6

Date of Response: April 10, 1990
Contact: Mr. Robert S. Turnbull
Title: President
Phone: (519) 623-1630
Fax: (519) 740-2977

Organization Type

Government Laboratory	
Technology Centre	
Community College	
University	
Industrial Company	Yes
Other (including Consulting)	

Total Staffing

1-24 Employees	
25-99 Employees	
100-499 Employees	
500-999 Employees	Yes
1 000+ Employees	
Total Staff	

R&D Staffing

Doctorate Level	
Master's Level	1
Bachelor's Level	11
Technologists	25
Total R&D Staff	37

Type of R&D Performed

Research	
Product Design	
Manufacturing Processes	Yes
Industrial Engineering	
Plant and Env. Hazards Eng.	
Test and Evaluation	

Vehicle Applicability

Alternate and Multifuel	
Electric and Hybrid	
Cars and Vans	Yes
Off-road Vehicles	
Trucks, Buses, Trailers	Yes
Specialty Vehicles	

Manufacturing Process Expertise

Metal Manufacturing Processes	
Plastics Manufacturing Processes	
Mfg. Machinery and Equipment	
Robotics	
Other Manufacturing Processes	

Knowledge Specialty

Aero and Fluid Dynamics	
CAD, CAM, CIM	
Finite Element Analysis	
Fuels and Lubricants	
Ergonomics and Industrial Design	
Joining and Fastening	
Materials: Ferrous Metals	
Materials: Non-ferrous Metals	
Materials: Plastics	5
Materials: Composites	
Materials: Rubber	
Materials: Glass	
Materials: Electrical/Electronic	
Finishes and Coatings	
Noise and Vibration	
Simulation and Modelling	
Stress/Strain/Stiffness	
Systems Integration	
Other	

Automotive Component Specialty

Body and Structure	
Electrical System	
Engines	
Emission Controls	
Heating, Ventilation and A/C	
Instruments and Controls	
Interior Trim and Components	5
Steering, Suspension, Brakes	
Transmission	
Safety	
Wheels and Tires	
Diagnostic and Service Equipment	

Affiliations With Other Organizations

None Reported.

R&D Projects

None Reported

Special R&D Facilities

Main product is PVC vinyl in roll form. Usual equipment for industrial product application groups (bulk or volume) as well as long term physical requirements such as weathering. Automotive applications are substantial portion of total business volume. Floor Space Devoted to R&D: 8 000 m^2.

Canadian Institute of Industrial Technology
Division of Electrical Engineering

435 Ellice Avenue
WINNIPEG, Man.
R3B 1Y6

Date of Response: April 5, 1990
Contact: Dr. M. Barakat
Title: Head, Robotics and Automation
Phone: (204) 983-7693
Fax: (204) 983-3154

Organization Type

Government Laboratory	Yes
Technology Centre	
Community College	
University	
Industrial Company	
Other (including Consulting)	

Total Staffing

1-24 Employees	
25-99 Employees	Yes
100-499 Employees	
500-999 Employees	
1 000+ Employees	
Total Staff	30

R&D Staffing

Doctorate Level	6
Master's Level	7
Bachelor's Level	3
Technologists	2
Total R&D Staff	

Type of R&D Performed

Research	Yes
Product Design	
Manufacturing Processes	
Industrial Engineering	
Plant and Env. Hazards Eng.	
Test and Evaluation	Yes

Vehicle Applicability

Alternate and Multifuel	
Electric and Hybrid	
Cars and Vans	
Off-road Vehicles	
Trucks, Buses, Trailers	
Specialty Vehicles	

Manufacturing Process Expertise

Metal Manufacturing Processes	
Plastics Manufacturing Processes	
Mfg. Machinery and Equipment	
Robotics	8
Other Manufacturing Processes	

Knowledge Specialty

Aero and Fluid Dynamics	
CAD, CAM, CIM	10
Finite Element Analysis	
Fuels and Lubricants	
Ergonomics and Industrial Design	
Joining and Fastening	
Materials: Ferrous Metals	
Materials: Non-ferrous Metals	
Materials: Plastics	
Materials: Composites	
Materials: Rubber	
Materials: Glass	
Materials: Electrical/Electronic	
Finishes and Coatings	
Noise and Vibration	
Simulation and Modelling	9
Stress/Strain/Stiffness	
Systems Integration	9
Other	

Automotive Component Specialty

Body and Structure	
Electrical System	
Engines	
Emission Controls	
Heating, Ventilation and A/C	
Instruments and Controls	
Interior Trim and Components	
Steering, Suspension, Brakes	
Transmission	
Safety	
Wheels and Tires	
Diagnostic and Service Equipment	

Affiliations With Other Organizations
National Research Council.

R&D Projects
Vision-based automated inspection. Integrated numerical control. Self-guided vehicles. Knowledge-based systems.

Special R&D Facilities
Advanced manufacturing facilities. Passive stereo vision facility. Large computer network. Knowledge-based development systems. Stereo lithography apparatus. Floor Space Devoted to R&D: Not Reported.

Carleton University

OTTAWA, Ont.
K1S 5B6

Date of Response: March 20, 1990
Contact: Anne Burgess
Title: University Research Officer
Phone: (613) 788-2516
Fax: (613) 788-2521

Organization Type	
Government Laboratory	
Technology Centre	
Community College	
University	Yes
Industrial Company	
Other (including Consulting)	

Total Staffing	
1-24 Employees	
25-99 Employees	
100-499 Employees	
500-999 Employees	
1 000+ Employees	Yes
Total Staff	

R&D Staffing	
Doctorate Level	
Master's Level	
Bachelor's Level	
Technologists	
Total R&D Staff	

Type of R&D Performed	
Research	Yes
Product Design	Yes
Manufacturing Processes	Yes
Industrial Engineering	Yes
Plant and Env. Hazards Eng.	
Test and Evaluation	Yes

Vehicle Applicability	
Alternate and Multifuel	
Electric and Hybrid	
Cars and Vans	
Off-road Vehicles	Yes
Trucks, Buses, Trailers	
Specialty Vehicles	

Manufacturing Process Expertise	
Metal Manufacturing Processes	5
Plastics Manufacturing Processes	
Mfg. Machinery and Equipment	
Robotics	5
Other Manufacturing Processes	

Knowledge Specialty	
Aero and Fluid Dynamics	5
CAD, CAM, CIM	5
Finite Element Analysis	5
Fuels and Lubricants	
Ergonomics and Industrial Design	5
Joining and Fastening	5
Materials: Ferrous Metals	
Materials: Non-ferrous Metals	
Materials: Plastics	
Materials: Composites	5
Materials: Rubber	
Materials: Glass	
Materials: Electrical/Electronic	
Finishes and Coatings	
Noise and Vibration	5
Simulation and Modelling	5
Stress/Strain/Stiffness	5
Systems Integration	5
Other	

Automotive Component Specialty	
Body and Structure	
Electrical System	
Engines	
Emission Controls	
Heating, Ventilation and A/C	
Instruments and Controls	
Interior Trim and Components	
Steering, Suspension, Brakes	
Transmission	
Safety	
Wheels and Tires	
Diagnostic and Service Equipment	

Affiliations With Other Organizations

Bell-Northern Research, DY-4 Ltd.

R&D Projects

None Reported.

Special R&D Facilities

Centre for Advanced Studies in Computer-Aided Design Engineering (CASCADE). Evaluates world-class CIDM software packages, and develops in-house expertise in using them. Also develops software in critical areas of CIDM. Floor Space Devoted to R&D: Not Reported.

Carleton University
School of Industrial Design

OTTAWA, Ont.
K1S 5B6

Date of Response: March 21, 1990
Contact: Jacques Giard
Title: Director
Phone: (613) 788-5674
Fax: (613) 788-4465

Organization Type	
Government Laboratory	
Technology Centre	
Community College	
University	Yes
Industrial Company	
Other (including Consulting)	

Total Staffing	
1-24 Employees	Yes
25-99 Employees	
100-499 Employees	
500-999 Employees	
1 000+ Employees	
Total Staff	11

R&D Staffing	
Doctorate Level	1
Master's Level	3
Bachelor's Level	2
Technologists	3
Total R&D Staff	9

Type of R&D Performed	
Research	Yes
Product Design	Yes
Manufacturing Processes	Yes
Industrial Engineering	
Plant and Env. Hazards Eng.	
Test and Evaluation	

Vehicle Applicability	
Alternate and Multifuel	
Electric and Hybrid	
Cars and Vans	Yes
Off-road Vehicles	Yes
Trucks, Buses, Trailers	Yes
Specialty Vehicles	Yes

Manufacturing Process Expertise	
Metal Manufacturing Processes	2
Plastics Manufacturing Processes	4
Mfg. Machinery and Equipment	4
Robotics	1
Other Manufacturing Processes	5

Knowledge Specialty	
Aero and Fluid Dynamics	
CAD, CAM, CIM	8
Finite Element Analysis	
Fuels and Lubricants	
Ergonomics and Industrial Design	10
Joining and Fastening	4
Materials: Ferrous Metals	4
Materials: Non-ferrous Metals	4
Materials: Plastics	6
Materials: Composites	5
Materials: Rubber	4
Materials: Glass	4
Materials: Electrical/Electronic	1
Finishes and Coatings	4
Noise and Vibration	1
Simulation and Modelling	1
Stress/Strain/Stiffness	1
Systems Integration	1
Other	

Automotive Component Specialty	
Body and Structure	
Electrical System	
Engines	
Emission Controls	
Heating, Ventilation and A/C	
Instruments and Controls	
Interior Trim and Components	7
Steering, Suspension, Brakes	
Transmission	
Safety	
Wheels and Tires	
Diagnostic and Service Equipment	

Affiliations With Other Organizations
None Reported.

R&D Projects
None Reported

Special R&D Facilities
General industrial design research workshops. Computer form organization - computer workstations. Floor Space Devoted to R&D: 500 m^2.

Cartech Consulting Services

01-1488 Main Street
P.O. Box 818
STITTSVILLE, Ont.
K0A 3G0

Date of Response: May 1, 19901
Contact: Frank Carr, P.Eng.
Title: President
Phone: (613) 831-1500
Fax: (613) 831-2913

Organization Type

Government Laboratory	
Technology Centre	
Community College	
University	
Industrial Company	
Other (including Consulting)	Yes

Total Staffing

1-24 Employees	Yes
25-99 Employees	
100-499 Employees	
500-999 Employees	
1 000+ Employees	
Total Staff	2

R&D Staffing

Doctorate Level	
Master's Level	
Bachelor's Level	
Technologists	1
Total R&D Staff	1

Type of R&D Performed

Research	
Product Design	Yes
Manufacturing Processes	
Industrial Engineering	
Plant and Env. Hazards Eng.	
Test and Evaluation	Yes

Vehicle Applicability

Alternate and Multifuel	
Electric and Hybrid	
Cars and Vans	
Off-road Vehicles	Yes
Trucks, Buses, Trailers	Yes
Specialty Vehicles	Yes

Manufacturing Process Expertise

Metal Manufacturing Processes	3
Plastics Manufacturing Processes	
Mfg. Machinery and Equipment	3
Robotics	
Other Manufacturing Processes	

Knowledge Specialty

Aero and Fluid Dynamics	3
CAD, CAM, CIM	3
Finite Element Analysis	3
Fuels and Lubricants	5
Ergonomics and Industrial Design	5
Joining and Fastening	3
Materials: Ferrous Metals	5
Materials: Non-ferrous Metals	3
Materials: Plastics	
Materials: Composites	
Materials: Rubber	
Materials: Glass	
Materials: Electrical/Electronic	
Finishes and Coatings	
Noise and Vibration	2
Simulation and Modelling	
Stress/Strain/Stiffness	
Systems Integration	3
Other	5

Automotive Component Specialty

Body and Structure	5
Electrical System	
Engines	3
Emission Controls	
Heating, Ventilation and A/C	
Instruments and Controls	3
Interior Trim and Components	
Steering, Suspension, Brakes	3
Transmission	3
Safety	
Wheels and Tires	5
Diagnostic and Service Equipment	

Affiliations With Other Organizations

None Reported.

R&D Projects

None Reported.

Special R&D Facilities

Floor Space Devoted to R&D: 18 m^2.

Centre de consultation et de formation en automatique et ordinique (CFAO)

840 Ste-Thérèse
QUEBEC CITY, Que.
C1N 1S7

Date of Response: May 10, 1990
Contact: Serge Coté
Title: Director
Phone: (418) 682-6543
Fax: (418) 682-5594

Organization Type	
Government Laboratory	
Technology Centre	
Community College	
University	
Industrial Company	
Other (including Consulting)	Yes

Total Staffing	
1-24 Employees	Yes
25-99 Employees	
100-499 Employees	
500-999 Employees	
1 000+ Employees	
Total Staff	

R&D Staffing	
Doctorate Level	
Master's Level	1
Bachelor's Level	2
Technologists	2
Total R&D Staff	5

Type of R&D Performed	
Research	Yes
Product Design	Yes
Manufacturing Processes	Yes
Industrial Engineering	
Plant and Env. Hazards Eng.	Yes
Test and Evaluation	Yes

Vehicle Applicability	
Alternate and Multifuel	
Electric and Hybrid	Yes
Cars and Vans	
Off-road Vehicles	
Trucks, Buses, Trailers	Yes
Specialty Vehicles	Yes

Manufacturing Process Expertise	
Metal Manufacturing Processes	5
Plastics Manufacturing Processes	5
Mfg. Machinery and Equipment	10
Robotics	10
Other Manufacturing Processes	

Knowledge Specialty	
Aero and Fluid Dynamics	10
CAD, CAM, CIM	10
Finite Element Analysis	10
Fuels and Lubricants	
Ergonomics and Industrial Design	5
Joining and Fastening	
Materials: Ferrous Metals	
Materials: Non-ferrous Metals	
Materials: Plastics	
Materials: Composites	7
Materials: Rubber	
Materials: Glass	5
Materials: Electrical/Electronic	10
Finishes and Coatings	
Noise and Vibration	5
Simulation and Modelling	10
Stress/Strain/Stiffness	10
Systems Integration	10
Other	

Automotive Component Specialty	
Body and Structure	5
Electrical System	10
Engines	
Emission Controls	
Heating, Ventilation and A/C	10
Instruments and Controls	10
Interior Trim and Components	2
Steering, Suspension, Brakes	
Transmission	
Safety	10
Wheels and Tires	
Diagnostic and Service Equipment	10

Affiliations With Other Organizations

Télémécanique - Eastern Quebec Training Centre. DAP Technologies — official R&D facilities.

R&D Projects

DAP 1000 telemetry system. SYMAN computer-integrated manufacturing software.

Special R&D Facilities

Programmable controller lab (8 units). UNIX network. Floor Space Devoted to R&D: 200 m^2.

Centre de recherche industrielle du Québec (CRIQ)

8475 Christophe-Colomb
MONTREAL, Que.
H2P 2X1

Date of Response: May 9, 1990
Contact: Yves Breault
Title: Technological Development Advisor
Phone: (514) 383-1550
Fax: (514) 383-3250

Organization Type	
Government Laboratory	
Technology Centre	Yes
Community College	
University	
Industrial Company	
Other (including Consulting)	

Type of R&D Performed	
Research	Yes
Product Design	Yes
Manufacturing Processes	Yes
Industrial Engineering	Yes
Plant and Env. Hazards Eng.	Yes
Test and Evaluation	Yes

Knowledge Specialty	
Aero and Fluid Dynamics	4
CAD, CAM, CIM	9
Finite Element Analysis	10
Fuels and Lubricants	5
Ergonomics and Industrial Design	8
Joining and Fastening	7
Materials: Ferrous Metals	7
Materials: Non-ferrous Metals	8
Materials: Plastics	8
Materials: Composites	8
Materials: Rubber	7
Materials: Glass	4
Materials: Electrical/Electronic	8
Finishes and Coatings	4
Noise and Vibration	9
Simulation and Modelling	7
Stress/Strain/Stiffness	8
Systems Integration	7
Other	

Total Staffing	
1-24 Employees	
25-99 Employees	
100-499 Employees	Yes
500-999 Employees	
1 000+ Employees	
Total Staff	465

Vehicle Applicability	
Alternate and Multifuel	
Electric and Hybrid	Yes
Cars and Vans	
Off-road Vehicles	Yes
Trucks, Buses, Trailers	Yes
Specialty Vehicles	Yes

R&D Staffing	
Doctorate Level	12
Master's Level	43
Bachelor's Level	147
Technologists	86
Total R&D Staff	288

Manufacturing Process Expertise	
Metal Manufacturing Processes	6
Plastics Manufacturing Processes	8
Mfg. Machinery and Equipment	9
Robotics	7
Other Manufacturing Processes	

Automotive Component Specialty	
Body and Structure	6
Electrical System	7
Engines	4
Emission Controls	3
Heating, Ventilation and A/C	8
Instruments and Controls	7
Interior Trim and Components	4
Steering, Suspension, Brakes	6
Transmission	6
Safety	5
Wheels and Tires	4
Diagnostic and Service Equipment	7

Affiliations With Other Organizations

Joint Venture with Groupe CFC (Montreal and Toronto) in TQC and COQ. Teaming with Fraunhofer-Institut, Stuttgart, in automation and vision. Teaming with National Institute of Magnesium Technology.

R&D Projects

HVAC design and testing. Valve cover noise and vibration reduction. Stoplight design and manufacturing process. Various FMVSS testing programs. Seat design and dynamic behavior. Coil spring plant study and engineering. Quality and productivity programs in parts manufacturing plants. Weather-stripping testing and performance analysis. Plastic and press-wood interior body panels. Seats and seat parts finite element analysis. Parts vibration and fatigue testing. On-board electronics.

Special R&D Facilities

McDonnell-Douglas and MATRA CAD/CAM systems. DENEB 'IGRIP' robot simulation and animation software. MTS Electro-hydraulic material testing system (500 000 lbf). Unholtz-Dickie electrodynamic vibration testing system (10 000 lbf). ZONIC structural behavior analysis system. Weather-O-Meter. ZENDEX vision system. MEGADAC data acquisition system. Air conditioning performance computer modelling. Floor Space Devoted to R&D: 26 000 m^2.

Centre spécialisé de technologie physique

140 4th Ave.
LA POCATIÈRE, Que.
G0R 1Z0

Date of Response: May 1, 1990
Contact: Fernand Landry
Title: Director
Phone: (418) 856-1525
Fax: (418) 856-3458

Organization Type

Government Laboratory	
Technology Centre	Yes
Community College	
University	
Industrial Company	
Other (including Consulting)	

Total Staffing

1-24 Employees	
25-99 Employees	Yes
100-499 Employees	
500-999 Employees	
1 000+ Employees	
Total Staff	34

R&D Staffing

Doctorate Level	
Master's Level	3
Bachelor's Level	18
Technologists	9
Total R&D Staff	30

Type of R&D Performed

Research	
Product Design	Yes
Manufacturing Processes	Yes
Industrial Engineering	Yes
Plant and Env. Hazards Eng.	
Test and Evaluation	

Vehicle Applicability

Alternate and Multifuel	
Electric and Hybrid	
Cars and Vans	
Off-road Vehicles	
Trucks, Buses, Trailers	
Specialty Vehicles	

Manufacturing Process Expertise

Metal Manufacturing Processes	
Plastics Manufacturing Processes	
Mfg. Machinery and Equipment	5
Robotics	5
Other Manufacturing Processes	

Knowledge Specialty

Aero and Fluid Dynamics	
CAD, CAM, CIM	5
Finite Element Analysis	
Fuels and Lubricants	
Ergonomics and Industrial Design	5
Joining and Fastening	
Materials: Ferrous Metals	
Materials: Non-ferrous Metals	
Materials: Plastics	
Materials: Composites	
Materials: Rubber	
Materials: Glass	
Materials: Electrical/Electronic	5
Finishes and Coatings	
Noise and Vibration	
Simulation and Modelling	
Stress/Strain/Stiffness	
Systems Integration	5
Other	

Automotive Component Specialty

Body and Structure	
Electrical System	5
Engines	
Emission Controls	
Heating, Ventilation and A/C	
Instruments and Controls	
Interior Trim and Components	
Steering, Suspension, Brakes	
Transmission	
Safety	
Wheels and Tires	
Diagnostic and Service Equipment	

Affiliations With Other Organizations

None Reported.

R&D Projects

None Reported.

Special R&D Facilities

Automation of manufacturing processes. Manufacturing process modernization assistance. CAD/CAM. Development of new high-technology products. Technical feasibility studies, systems engineering and laboratory testing. Floor Space Devoted to R&D: 200 m^2.

Circo Craft

205 Brunswick Boulevard
POINTE-CLAIRE, Que.
H9R 1A5

Date of Response: **July 12, 1990**
Contact: **Gérard P. Hould**
Title: **Technology Director**
Phone: **(514) 694-8400**
Fax: **(514) 694-2696**

Organization Type	
Government Laboratory	
Technology Centre	
Community College	
University	
Industrial Company	Yes
Other (including Consulting)	

Total Staffing
1-24 Employees
25-99 Employees
100-499 Employees
500-999 Employees
1 000+ Employees
Total Staff

R&D Staffing
Doctorate Level
Master's Level
Bachelor's Level
Technologists
Total R&D Staff

Type of R&D Performed
Research
Product Design
Manufacturing Processes
Industrial Engineering
Plant and Env. Hazards Eng.
Test and Evaluation

Vehicle Applicability
Alternate and Multifuel
Electric and Hybrid
Cars and Vans
Off-road Vehicles
Trucks, Buses, Trailers
Specialty Vehicles

Manufacturing Process Expertise
Metal Manufacturing Processes
Plastics Manufacturing Processes
Mfg. Machinery and Equipment
Robotics
Other Manufacturing Processes

Knowledge Specialty
Aero and Fluid Dynamics
CAD, CAM, CIM
Finite Element Analysis
Fuels and Lubricants
Ergonomics and Industrial Design
Joining and Fastening
Materials: Ferrous Metals
Materials: Non-ferrous Metals
Materials: Plastics
Materials: Composites
Materials: Rubber
Materials: Glass
Materials: Electrical/Electronic
Finishes and Coatings
Noise and Vibration
Simulation and Modelling
Stress/Strain/Stiffness
Systems Integration
Other

Automotive Component Specialty
Body and Structure
Electrical System
Engines
Emission Controls
Heating, Ventilation and A/C
Instruments and Controls
Interior Trim and Components
Steering, Suspension, Brakes
Transmission
Safety
Wheels and Tires
Diagnostic and Service Equipment

Affiliations With Other Organizations
Teaming with Motorola on development and manufacturing of printed circuits used by Ford.

R&D Projects
None Reported.

Special R&D Facilities
We are presently building a QTA division, with 30 percent of capacity devoted to R&D. Floor Space Devoted to R&D: Not Reported.

Command Start Inc.

204 Day Street
WINNIPEG, Man.
R2C 1A8

Date of Response: March 26, 1990
Contact: Michael H. Tyrer
Title: International Sales Manager
Phone: (204) 222-3028
Fax: (204) 222-0846

Organization Type		**Total Staffing**		**R&D Staffing**	
Government Laboratory		1-24 Employees	Yes	Doctorate Level	
Technology Centre		25-99 Employees		Master's Level	1
Community College		100-499 Employees		Bachelor's Level	2
University		500-999 Employees		Technologists	1
Industrial Company	Yes	1 000+ Employees		Total R&D Staff	4
Other (including Consulting)		Total Staff			

Type of R&D Performed		**Vehicle Applicability**		**Manufacturing Process Expertise**
Research		Alternate and Multifuel	Yes	Metal Manufacturing Processes
Product Design	Yes	Electric and Hybrid		Plastics Manufacturing Processes
Manufacturing Processes	Yes	Cars and Vans	Yes	Mfg. Machinery and Equipment
Industrial Engineering		Off-road Vehicles		Robotics
Plant and Env. Hazards Eng.		Trucks, Buses, Trailers	Yes	Other Manufacturing Processes
Test and Evaluation		Specialty Vehicles		

Knowledge Specialty			**Automotive Component Specialty**	
Aero and Fluid Dynamics		Finishes and Coatings	Body and Structure	
CAD, CAM, CIM	10	Noise and Vibration	Electrical System	10
Finite Element Analysis		Simulation and Modelling	Engines	
Fuels and Lubricants		Stress/Strain/Stiffness	Emission Controls	
Ergonomics and Industrial Design		Systems Integration	Heating, Ventilation and A/C	
Joining and Fastening		Other	Instruments and Controls	
Materials: Ferrous Metals			Interior Trim and Components	
Materials: Non-ferrous Metals			Steering, Suspension, Brakes	
Materials: Plastics			Transmission	
Materials: Composites			Safety	
Materials: Rubber			Wheels and Tires	
Materials: Glass			Diagnostic and Service Equipment	
Materials: Electrical/Electronic	10			

Affiliations With Other Organizations

Member of AIA Canada and Manitoba Chamber of Commerce.

R&D Projects

Developed a remote control automotive engine starter. System is being designed and miniaturized. Developing a new car security alarm. Developing radio-frequency communication systems.

Special R&D Facilities

Note: R&D staff work for two companies. Sister company is Kraus Industries (Electronic and Petroleum products). Floor Space Devoted to R&D: 1000 m^2.

Composite Technological Materials Centre

455 Fournier
SAINT-JÉRÔME, Que.
J7Z 4V2

Date of Response: **May 1, 1990**
Contact: **Robert Guillemette**
Title: **Director**
Phone: **(514) 436-3042**
Fax: **(514) 436-1685**

Organization Type

Government Laboratory	
Technology Centre	Yes
Community College	
University	
Industrial Company	
Other (including Consulting)	

Total Staffing

1-24 Employees	
25-99 Employees	Yes
100-499 Employees	
500-999 Employees	
1 000+ Employees	
Total Staff	

R&D Staffing

Doctorate Level	1
Master's Level	2
Bachelor's Level	6
Technologists	7
Total R&D Staff	16

Type of R&D Performed

Research	Yes
Product Design	Yes
Manufacturing Processes	Yes
Industrial Engineering	
Plant and Env. Hazards Eng.	
Test and Evaluation	Yes

Vehicle Applicability

Alternate and Multifuel	
Electric and Hybrid	Yes
Cars and Vans	Yes
Off-road Vehicles	Yes
Trucks, Buses, Trailers	Yes
Specialty Vehicles	

Manufacturing Process Expertise

Metal Manufacturing Processes	
Plastics Manufacturing Processes	10
Mfg. Machinery and Equipment	
Robotics	
Other Manufacturing Processes	

Knowledge Specialty

Aero and Fluid Dynamics	
CAD, CAM, CIM	8
Finite Element Analysis	8
Fuels and Lubricants	
Ergonomics and Industrial Design	5
Joining and Fastening	7
Materials: Ferrous Metals	
Materials: Non-ferrous Metals	
Materials: Plastics	5
Materials: Composites	10
Materials: Rubber	6
Materials: Glass	
Materials: Electrical/Electronic	
Finishes and Coatings	
Noise and Vibration	
Simulation and Modelling	6
Stress/Strain/Stiffness	
Systems Integration	
Other	

Automotive Component Specialty

Body and Structure	10
Electrical System	
Engines	
Emission Controls	
Heating, Ventilation and A/C	
Instruments and Controls	
Interior Trim and Components	8
Steering, Suspension, Brakes	
Transmission	
Safety	
Wheels and Tires	
Diagnostic and Service Equipment	

Affiliations With Other Organizations

Composites Group from École Polytechnique de Montréal. Corporate Member of the Canadian Association for Structures and Composite Materials.

R&D Projects

Composite materials applications for transportation. Work performed on processing, parts design, materials selection and analysis, mould design, prototyping and testing.

Special R&D Facilities

Process labs for filament winding, autoclave, moulding pultrusion, high pressure press moulding for SMC, BMC and compounding, low pressure press for resin transfer moulding (RTM), vacuum moulding and other processes, tooling. Complete CAD/CAM system with 3D analysis system on STRIM 100 software including finite element analysis, test facilities, laboratories for mechanical and chemical evaluation. Floor Space Devoted to R&D: 2 500 m^2.

Concordia University
CONCAVE Research Centre

CR-200
1455 de Maisonneuve Blvd. West
MONTREAL, Que.
H3G 1M8

Date of Response: May 24, 1990
Contact: Dr. S Sankar
Title: Director
Phone: (514) 848-7930
Fax: (514) 848-8635

Organization Type	
Government Laboratory	
Technology Centre	
Community College	
University	Yes
Industrial Company	
Other (including Consulting)	

Total Staffing	
1-24 Employees	
25-99 Employees	Yes
100-499 Employees	
500-999 Employees	
1 000+ Employees	
Total Staff	35

R&D Staffing	
Doctorate Level	8
Master's Level	10
Bachelor's Level	13
Technologists	2
Total R&D Staff	33

Type of R&D Performed	
Research	Yes
Product Design	Yes
Manufacturing Processes	
Industrial Engineering	
Plant and Env. Hazards Eng.	
Test and Evaluation	Yes

Vehicle Applicability	
Alternate and Multifuel	
Electric and Hybrid	
Cars and Vans	Yes
Off-road Vehicles	Yes
Trucks, Buses, Trailers	Yes
Specialty Vehicles	Yes

Manufacturing Process Expertise	
Metal Manufacturing Processes	
Plastics Manufacturing Processes	
Mfg. Machinery and Equipment	
Robotics	
Other Manufacturing Processes	

Knowledge Specialty	
Aero and Fluid Dynamics	
CAD, CAM, CIM	10
Finite Element Analysis	10
Fuels and Lubricants	
Ergonomics and Industrial Design	8
Joining and Fastening	
Materials: Ferrous Metals	9
Materials: Non-ferrous Metals	
Materials: Plastics	
Materials: Composites	
Materials: Rubber	
Materials: Glass	
Materials: Electrical/Electronic	
Finishes and Coatings	
Noise and Vibration	10
Simulation and Modelling	10
Stress/Strain/Stiffness	10
Systems Integration	
Other	

Automotive Component Specialty	
Body and Structure	
Electrical System	
Engines	
Emission Controls	
Heating, Ventilation and A/C	
Instruments and Controls	
Interior Trim and Components	
Steering, Suspension, Brakes	10
Transmission	
Safety	9
Wheels and Tires	9
Diagnostic and Service Equipment	

Affiliations With Other Organizations
Collaborated with over 40 industries and government organizations on numerous projects. Projects for Bombardier, Remtec, Via Rail, FERIC, Prévost, Hydro-Québec, Bell Helicopter, Héroux, Transport Québec, Ontario MTC, Transport Canada, NRC, IRSST, CRIQ.

R&D Projects
Vehicle dynamics (testing and simulation software): heavy vehicle stability and handling; development of expert system for heavy vehicle dynamics; liquid tanker stability and interaction of fluid slosh; heavy vehicle pavement loading; advanced suspensions (active, semi-active, and adaptive); seat and cab suspensions. Structural analysis, design and testing. Development of expert systems in vehicle. Development of vehicle simulator.

Special R&D Facilities
Unique vehicle test facility with five electro-hydraulic servo-actuators to accomodate cars, trucks, buses to 6 m x 18 m and gross weights to 200 kN (45 000 lbs) for vibration testing and real time simulation. Instrumentation, data recording and analysis systems for both laboratory and field testing. Computing facilities include mainframe, workstations, minis and micros, and run several engineering software packages for design, analysis and simulation. Floor Space Devoted to R&D: 1 200 m^2.

Concordia University
Department of Mechanical Engineering

1455 de Maisonneuve Blvd. West
MONTREAL, Que.
H3G 1M8

Date of Response: May 30, 1990
Contact: Dr. M.O.M. Osman
Title: Chairman
Phone: (514) 848-3133

Organization Type	
Government Laboratory	
Technology Centre	
Community College	
University	Yes
Industrial Company	
Other (including Consulting)	

Total Staffing	
1-24 Employees	
25-99 Employees	Yes
100-499 Employees	
500-999 Employees	
1 000+ Employees	
Total Staff	27

R&D Staffing	
Doctorate Level	5
Master's Level	7
Bachelor's Level	6
Technologists	3
Total R&D Staff	21

Type of R&D Performed	
Research	Yes
Product Design	
Manufacturing Processes	
Industrial Engineering	
Plant and Env. Hazards Eng.	
Test and Evaluation	Yes

Vehicle Applicability	
Alternate and Multifuel	Yes
Electric and Hybrid	
Cars and Vans	Yes
Off-road Vehicles	Yes
Trucks, Buses, Trailers	Yes
Specialty Vehicles	

Manufacturing Process Expertise	
Metal Manufacturing Processes	
Plastics Manufacturing Processes	7
Mfg. Machinery and Equipment	
Robotics	6
Other Manufacturing Processes	

Knowledge Specialty	
Aero and Fluid Dynamics	7
CAD, CAM, CIM	6
Finite Element Analysis	5
Fuels and Lubricants	6
Ergonomics and Industrial Design	
Joining and Fastening	
Materials: Ferrous Metals	
Materials: Non-ferrous Metals	
Materials: Plastics	
Materials: Composites	9
Materials: Rubber	
Materials: Glass	
Materials: Electrical/Electronic	
Finishes and Coatings	
Noise and Vibration	8
Simulation and Modelling	8
Stress/Strain/Stiffness	
Systems Integration	
Other	

Automotive Component Specialty	
Body and Structure	7
Electrical System	6
Engines	6
Emission Controls	
Heating, Ventilation and A/C	
Instruments and Controls	7
Interior Trim and Components	
Steering, Suspension, Brakes	8
Transmission	
Safety	
Wheels and Tires	
Diagnostic and Service Equipment	

Affiliations With Other Organizations
Bombardier, Bendix Avelex, Pratt and Whitney Canada.

R&D Projects
Vehicle dynamics and drivetrain evaluation. Chassis strength and vibration characteristics. Electronic fuel controls. Gaseous alternative fuels. Composite automotive components. Automatically guided vehicles. Driving simulators.

Special R&D Facilities
Vehicle wheel drive and track testing stand. Vehicle chassis dynamic test stand. Engine dynamometer. Robot evaluation stand. Composite vessel test stand. Fuel system test bench. Floor Space Devoted to R&D: 220 m^2.

Concordia University
Science Industrial Research Unit

1455 de Maisonneuve West
MONTREAL, Que.
H3G 1M8

Date of Response: May 24, 1990
Contact: Robert T. Patterson
Title: Director
Phone: (514) 848-3353
Fax: (514) 848-3494

Organization Type

Government Laboratory	
Technology Centre	
Community College	
University	Yes
Industrial Company	
Other (including Consulting)	

Total Staffing

1-24 Employees	Yes
25-99 Employees	
100-499 Employees	
500-999 Employees	
1 000+ Employees	
Total Staff	

R&D Staffing

Doctorate Level	
Master's Level	1
Bachelor's Level	1
Technologists	1
Total R&D Staff	3

Type of R&D Performed
Research
Product Design
Manufacturing Processes
Industrial Engineering
Plant and Env. Hazards Eng.
Test and Evaluation

Vehicle Applicability
Alternate and Multifuel
Electric and Hybrid
Cars and Vans
Off-road Vehicles
Trucks, Buses, Trailers
Specialty Vehicles

Manufacturing Process Expertise
Metal Manufacturing Processes
Plastics Manufacturing Processes
Mfg. Machinery and Equipment
Robotics
Other Manufacturing Processes

Knowledge Specialty

Aero and Fluid Dynamics	
CAD, CAM, CIM	
Finite Element Analysis	8
Fuels and Lubricants	
Ergonomics and Industrial Design	
Joining and Fastening	
Materials: Ferrous Metals	3
Materials: Non-ferrous Metals	3
Materials: Plastics	3
Materials: Composites	
Materials: Rubber	
Materials: Glass	
Materials: Electrical/Electronic	
Finishes and Coatings	
Noise and Vibration	
Simulation and Modelling	
Stress/Strain/Stiffness	
Systems Integration	
Other	

Automotive Component Specialty
Body and Structure
Electrical System
Engines
Emission Controls
Heating, Ventilation and A/C
Instruments and Controls
Interior Trim and Components
Steering, Suspension, Brakes
Transmission
Safety
Wheels and Tires
Diagnostic and Service Equipment

Affiliations With Other Organizations
None Reported.

R&D Projects
None Reported.

Special R&D Facilities
Analytical instrumentation. Floor Space Devoted to R&D: Not Reported.

DBM Reflex Entreprise Inc.

5657 Dessiant Street
SAINT-LAURENT, Que.
H4S 1M8

Date of Response: May 23, 1990
Contact: Italo Caroli
Title: President
Phone: (514) 331-7280
Fax: (514) 331-6775

Organization Type

Government Laboratory	
Technology Centre	
Community College	
University	
Industrial Company	Yes
Other (including Consulting)	

Total Staffing

1-24 Employees	
25-99 Employees	Yes
100-499 Employees	
500-999 Employees	
1 000+ Employees	
Total Staff	

R&D Staffing

Doctorate Level	
Master's Level	1
Bachelor's Level	2
Technologists	1
Total R&D Staff	4

Type of R&D Performed

Research	Yes
Product Design	Yes
Manufacturing Processes	Yes
Industrial Engineering	
Plant and Env. Hazards Eng.	
Test and Evaluation	Yes

Vehicle Applicability

Alternate and Multifuel	Yes
Electric and Hybrid	Yes
Cars and Vans	Yes
Off-road Vehicles	Yes
Trucks, Buses, Trailers	Yes
Specialty Vehicles	Yes

Manufacturing Process Expertise

Metal Manufacturing Processes	10
Plastics Manufacturing Processes	8
Mfg. Machinery and Equipment	10
Robotics	
Other Manufacturing Processes	

Knowledge Specialty

Aero and Fluid Dynamics	
CAD, CAM, CIM	10
Finite Element Analysis	5
Fuels and Lubricants	
Ergonomics and Industrial Design	
Joining and Fastening	
Materials: Ferrous Metals	
Materials: Non-ferrous Metals	
Materials: Plastics	2
Materials: Composites	
Materials: Rubber	
Materials: Glass	
Materials: Electrical/Electronic	5
Finishes and Coatings	
Noise and Vibration	
Simulation and Modelling	3
Stress/Strain/Stiffness	
Systems Integration	
Other	

Automotive Component Specialty

Body and Structure	
Electrical System	10
Engines	
Emission Controls	
Heating, Ventilation and A/C	
Instruments and Controls	
Interior Trim and Components	2
Steering, Suspension, Brakes	
Transmission	
Safety	
Wheels and Tires	
Diagnostic and Service Equipment	

Affiliations With Other Organizations

None Reported.

R&D Projects

Optical systems for automotive lighting equipment.

Special R&D Facilities

Photometric tunnel to measure light output of automotive lighting equipment: tail lamps, front lamps, side markers. Floor Space Devoted to R&D: 350 m^2.

DSMA International Inc.

6655 Airport Road
MISSISSAUGA, Ont.
L4V 1V8

Date of Response: July 27, 1990
Contact: John D. Jackson
Title: Marketing Director
Phone: (416) 672-3800
Fax: (416) 672-3507

Organization Type	
Government Laboratory	
Technology Centre	
Community College	
University	
Industrial Company	Yes
Other (including Consulting)	

Total Staffing	
1-24 Employees	
25-99 Employees	
100-499 Employees	Yes
500-999 Employees	
1 000+ Employees	
Total Staff	105

R&D Staffing	
Doctorate Level	1
Master's Level	10
Bachelor's Level	1
Technologists	
Total R&D Staff	12

Type of R&D Performed	
Research	
Product Design	
Manufacturing Processes	
Industrial Engineering	
Plant and Env. Hazards Eng.	
Test and Evaluation	Yes

Vehicle Applicability	
Alternate and Multifuel	Yes
Electric and Hybrid	Yes
Cars and Vans	Yes
Off-road Vehicles	Yes
Trucks, Buses, Trailers	Yes
Specialty Vehicles	Yes

Manufacturing Process Expertise	
Metal Manufacturing Processes	3
Plastics Manufacturing Processes	2
Mfg. Machinery and Equipment	4
Robotics	9
Other Manufacturing Processes	5

Knowledge Specialty	
Aero and Fluid Dynamics	10
CAD, CAM, CIM	8
Finite Element Analysis	10
Fuels and Lubricants	7
Ergonomics and Industrial Design	2
Joining and Fastening	3
Materials: Ferrous Metals	4
Materials: Non-ferrous Metals	4
Materials: Plastics	4
Materials: Composites	4
Materials: Rubber	4
Materials: Glass	4
Materials: Electrical/Electronic	8
Finishes and Coatings	4
Noise and Vibration	8
Simulation and Modelling	8
Stress/Strain/Stiffness	8
Systems Integration	10
Other	

Automotive Component Specialty	
Body and Structure	10
Electrical System	3
Engines	7
Emission Controls	7
Heating, Ventilation and A/C	10
Instruments and Controls	2
Interior Trim and Components	2
Steering, Suspension, Brakes	3
Transmission	7
Safety	3
Wheels and Tires	5
Diagnostic and Service Equipment	5

Affiliations With Other Organizations

Co-operative R&D programs for automotive aerodynamics and thermodynamics are often established in conjunction with owners of DSMA-designed full-scale test facilities. Examples include Porsche AG, AB Volvo Car, NRC Canada, and Imperial Oil Ltd.

R&D Projects

Representative contract R&D programs for outside clients include: Navistar International (aerodynamic drag measurements for Class 8 trucks), PACCAR Inc. (surface pressure measurement surveys for Class 8 truck HVAC systems), Porsche AG (aerodynamic measurements for Porsche 924, 956 and prototype models), Behr AG (surface pressure measurement surveys for commercial truck and bus HVAC systems).

Special R&D Facilities

Model-scale low-speed wind tunnel test facility, suitable for automotive aerodynamics investigations at vehicle scales from 10 percent to 25 percent. The facility provides aeronautical-class flow quality at wind speeds up to 240 km/h. Slotted-wall, 3/4 open jet and open jet test section configurations are available. Pilot wind tunnel test facility, suitable for model-scale investigations of automotive HVAC systems at vehicle scales of 10 percent to 25 percent. Floor Space Devoted to R&D: 350 m^2.

Defence and Civil Institute of Environmental Medicine

Biodynamics Group

1133 Sheppard Ave. West
P.O. Box 2000
NORTH YORK, Ont.
M3M 3B9

Date of Response: April 4, 1990
Contact: D.R. Day
Title: Head
Phone: (416) 635-2000
Fax: (416) 635-2104

Organization Type	
Government Laboratory	Yes
Technology Centre	
Community College	
University	
Industrial Company	
Other (including Consulting)	

Total Staffing	
1-24 Employees	
25-99 Employees	
100-499 Employees	Yes
500-999 Employees	
1 000+ Employees	
Total Staff	200

R&D Staffing	
Doctorate Level	
Master's Level	1
Bachelor's Level	
Technologists	1
Total R&D Staff	2

Type of R&D Performed	
Research	Yes
Product Design	
Manufacturing Processes	
Industrial Engineering	
Plant and Env. Hazards Eng.	
Test and Evaluation	Yes

Vehicle Applicability	
Alternate and Multifuel	
Electric and Hybrid	
Cars and Vans	Yes
Off-road Vehicles	
Trucks, Buses, Trailers	
Specialty Vehicles	

Manufacturing Process Expertise	
Metal Manufacturing Processes	
Plastics Manufacturing Processes	
Mfg. Machinery and Equipment	
Robotics	
Other Manufacturing Processes	

Knowledge Specialty

Aero and Fluid Dynamics
CAD, CAM, CIM
Finite Element Analysis
Fuels and Lubricants
Ergonomics and Industrial Design
Joining and Fastening
Materials: Ferrous Metals
Materials: Non-ferrous Metals
Materials: Plastics
Materials: Composites
Materials: Rubber
Materials: Glass
Materials: Electrical/Electronic
Finishes and Coatings
Noise and Vibration
Simulation and Modelling
Stress/Strain/Stiffness
Systems Integration
Other

Automotive Component Specialty	
Body and Structure	
Electrical System	
Engines	
Emission Controls	
Heating, Ventilation and A/C	
Instruments and Controls	
Interior Trim and Components	
Steering, Suspension, Brakes	
Transmission	
Safety	8
Wheels and Tires	
Diagnostic and Service Equipment	

Affiliations With Other Organizations

Transport Canada.

R&D Projects

Impact studies/protection.

Special R&D Facilities

Bendix HYGE crash simulator system. Floor Space Devoted to R&D: 700 m^2.

Diffracto Limited

2835 Kow Drive
WINDSOR, Ont.
N8T 3B7

Date of Response: July 16, 1990
Contact: Omer L. Hageniers
Title: President
Phone: (519) 945-6373
Fax: (519) 945-1467

Organization Type

Government Laboratory	
Technology Centre	
Community College	
University	
Industrial Company	Yes
Other (including Consulting)	

Total Staffing

1-24 Employees	
25-99 Employees	Yes
100-499 Employees	
500-999 Employees	
1 000+ Employees	
Total Staff	38

R&D Staffing

Doctorate Level	3
Master's Level	3
Bachelor's Level	8
Technologists	4
Total R&D Staff	16

Type of R&D Performed

Research	Yes
Product Design	Yes
Manufacturing Processes	Yes
Industrial Engineering	
Plant and Env. Hazards Eng.	
Test and Evaluation	

Vehicle Applicability

Alternate and Multifuel
Electric and Hybrid
Cars and Vans
Off-road Vehicles
Trucks, Buses, Trailers
Specialty Vehicles

Manufacturing Process Expertise

Metal Manufacturing Processes	
Plastics Manufacturing Processes	
Mfg. Machinery and Equipment	10
Robotics	6
Other Manufacturing Processes	

Knowledge Specialty

Aero and Fluid Dynamics
CAD, CAM, CIM
Finite Element Analysis
Fuels and Lubricants
Ergonomics and Industrial Design
Joining and Fastening
Materials: Ferrous Metals
Materials: Non-ferrous Metals
Materials: Plastics
Materials: Composites
Materials: Rubber
Materials: Glass
Materials: Electrical/Electronic
Finishes and Coatings
Noise and Vibration
Simulation and Modelling
Stress/Strain/Stiffness
Systems Integration
Other

Automotive Component Specialty

Body and Structure	10
Electrical System	
Engines	
Emission Controls	
Heating, Ventilation and A/C	
Instruments and Controls	
Interior Trim and Components	
Steering, Suspension, Brakes	
Transmission	
Safety	
Wheels and Tires	
Diagnostic and Service Equipment	

Affiliations With Other Organizations

General Motors.

R&D Projects

Automated surface inspection equipment.

Special R&D Facilities

Optical laboratories to carry out dimensional and defect detection. Floor Space Devoted to R&D: 500 m^2.

Eberhard Hardware Manufacturing Limited

67 Goshen Street
P.O. Box 367
TILLSONBURG, Ont.
N4G 4H8

Date of Response: March 22, 1990
Contact: Mr. Robert G. Alexander
Title: Operations Manager
Phone: (519) 842-8457
Fax: (519) 688-0575

Organization Type	
Government Laboratory	
Technology Centre	
Community College	
University	
Industrial Company	Yes
Other (including Consulting)	

Total Staffing	
1-24 Employees	
25-99 Employees	Yes
100-499 Employees	
500-999 Employees	
1 000+ Employees	
Total Staff	30

R&D Staffing	
Doctorate Level	
Master's Level	
Bachelor's Level	
Technologists	
Total R&D Staff	5

Type of R&D Performed	
Research	Yes
Product Design	Yes
Manufacturing Processes	Yes
Industrial Engineering	Yes
Plant and Env. Hazards Eng.	
Test and Evaluation	Yes

Vehicle Applicability	
Alternate and Multifuel	
Electric and Hybrid	
Cars and Vans	Yes
Off-road Vehicles	
Trucks, Buses, Trailers	Yes
Specialty Vehicles	

Manufacturing Process Expertise	
Metal Manufacturing Processes	9
Plastics Manufacturing Processes	
Mfg. Machinery and Equipment	7
Robotics	7
Other Manufacturing Processes	

Knowledge Specialty	
Aero and Fluid Dynamics	2
CAD, CAM, CIM	5
Finite Element Analysis	
Fuels and Lubricants	5
Ergonomics and Industrial Design	4
Joining and Fastening	7
Materials: Ferrous Metals	7
Materials: Non-ferrous Metals	7
Materials: Plastics	6
Materials: Composites	4
Materials: Rubber	5
Materials: Glass	
Materials: Electrical/Electronic	4
Finishes and Coatings	8
Noise and Vibration	6
Simulation and Modelling	8
Stress/Strain/Stiffness	5
Systems Integration	7
Other	

Automotive Component Specialty	
Body and Structure	
Electrical System	
Engines	
Emission Controls	
Heating, Ventilation and A/C	
Instruments and Controls	
Interior Trim and Components	
Steering, Suspension, Brakes	
Transmission	
Safety	
Wheels and Tires	
Diagnostic and Service Equipment	

Affiliations With Other Organizations

Subsidiary of Eastern Company of Naugatuck, Connecticut. Sister company of Eberhard Manufacturing Co. of Cleveland, Ohio.

R&D Projects

Product design engineering: latch for spare tire carrier being designed for Ford Motor Company.

Special R&D Facilities

Cycle testing equipment for testing latches. Floor Space Devoted to R&D: 55 m^2.

École Polytechnique de Montréal

P.O. Box 6079, Station A
MONTREAL, Que.
H3C 3A7

Date of Response: **April 26, 1990**
Contact: **Jean Paris**
Title: **Technology Transfer Advisor**
Phone: **(514) 340-4958**
Fax: **(514) 340-4019**

Organization Type	
Government Laboratory	
Technology Centre	
Community College	
University	Yes
Industrial Company	
Other (including Consulting)	

Total Staffing	
1-24 Employees	
25-99 Employees	
100-499 Employees	
500-999 Employees	Yes
1 000+ Employees	
Total Staff	

R&D Staffing	
Doctorate Level	200
Master's Level	100
Bachelor's Level	100
Technologists	
Total R&D Staff	400

Type of R&D Performed	
Research	Yes
Product Design	
Manufacturing Processes	
Industrial Engineering	Yes
Plant and Env. Hazards Eng.	
Test and Evaluation	Yes

Vehicle Applicability	
Alternate and Multifuel	Yes
Electric and Hybrid	
Cars and Vans	
Off-road Vehicles	
Trucks, Buses, Trailers	
Specialty Vehicles	

Manufacturing Process Expertise	
Metal Manufacturing Processes	
Plastics Manufacturing Processes	5
Mfg. Machinery and Equipment	
Robotics	5
Other Manufacturing Processes	5

Knowledge Specialty	
Aero and Fluid Dynamics	5
CAD, CAM, CIM	5
Finite Element Analysis	5
Fuels and Lubricants	
Ergonomics and Industrial Design	5
Joining and Fastening	
Materials: Ferrous Metals	
Materials: Non-ferrous Metals	
Materials: Plastics	5
Materials: Composites	5
Materials: Rubber	
Materials: Glass	
Materials: Electrical/Electronic	5
Finishes and Coatings	5
Noise and Vibration	
Simulation and Modelling	5
Stress/Strain/Stiffness	5
Systems Integration	
Other	

Automotive Component Specialty
Body and Structure
Electrical System
Engines
Emission Controls
Heating, Ventilation and A/C
Instruments and Controls
Interior Trim and Components
Steering, Suspension, Brakes
Transmission
Safety
Wheels and Tires
Diagnostic and Service Equipment

Affiliations With Other Organizations

Note: Data apply to whole university. 400 professional staff, 465 support staff and 1 050 graduate students.

R&D Projects

Printed circuits, AI, hydrogen fuel, scientific calculation in fluid mechanics, injection moulding, operational research in urban transportation, soft clay excavation, assessment of the surface condition of pavements, automatic inspection of railroad rails, guidance system, fluid mechanics, finite elements, turbine flow analysis, fatigue behaviour and reaction to creep of materials, processing and mechanical characterization of plastics.

Special R&D Facilities

Centre for applied research on polymers, laboratory studying the industrial application of microwaves, decision-making analysis study and research team, computer-assisted engineering mathematics, transportation research centre. Industrial chair in the study of high-temperature materials, centre for microscopic characterization of materials, Canadian Centre for Automation and Robotics in Mining, thin layer research group, opto-electronics laboratory. Floor Space Devoted to R&D: 10 000 m^2.

École Polytechnique de Montréal
Centre de caractérisation microscopique des matériaux

P.O. Box 6079, Station A
MONTREAL, Que.
H3C 3A7

Date of Response: July 12, 1990
Contact: Gilles L'Espérance
Title: Director
Phone: (514) 340-4532
Fax: (514) 340-4468

Organization Type

Government Laboratory	
Technology Centre	
Community College	
University	Yes
Industrial Company	
Other (including Consulting)	

Total Staffing

1-24 Employees	Yes
25-99 Employees	
100-499 Employees	
500-999 Employees	
1 000+ Employees	
Total Staff	9

R&D Staffing

Doctorate Level	2
Master's Level	2
Bachelor's Level	
Technologists	4
Total R&D Staff	8

Type of R&D Performed

Research	Yes
Product Design	Yes
Manufacturing Processes	Yes
Industrial Engineering	Yes
Plant and Env. Hazards Eng.	
Test and Evaluation	Yes

Vehicle Applicability

Alternate and Multifuel	
Electric and Hybrid	
Cars and Vans	
Off-road Vehicles	
Trucks, Buses, Trailers	
Specialty Vehicles	10

Manufacturing Process Expertise

Metal Manufacturing Processes	10
Plastics Manufacturing Processes	6
Mfg. Machinery and Equipment	10
Robotics	
Other Manufacturing Processes	

Knowledge Specialty

Aero and Fluid Dynamics	
CAD, CAM, CIM	
Finite Element Analysis	
Fuels and Lubricants	
Ergonomics and Industrial Design	
Joining and Fastening	
Materials: Ferrous Metals	10
Materials: Non-ferrous Metals	10
Materials: Plastics	3
Materials: Composites	10
Materials: Rubber	5
Materials: Glass	5
Materials: Electrical/Electronic	8
Finishes and Coatings	8
Noise and Vibration	
Simulation and Modelling	
Stress/Strain/Stiffness	8
Systems Integration	
Other	

Automotive Component Specialty

Body and Structure	10
Electrical System	
Engines	
Emission Controls	
Heating, Ventilation and A/C	
Instruments and Controls	
Interior Trim and Components	
Steering, Suspension, Brakes	
Transmission	
Safety	
Wheels and Tires	
Diagnostic and Service Equipment	1

Affiliations With Other Organizations

Founding Members: Alcan Aluminum Ltd.; Exeltor Inc., Himont Canada Inc., IBM Canada Ltd.; Hydro-Québec Research Institute, Eldorado Resources Ltd.; Pratt and Whitney Canada, QIT - Iron and titanium Inc., Sidbec-Dosco Inc., Stelco Inc., Tioxide Canada Inc., Xerox Canada Inc. Corporate Members: Canadian Liquid Air Ltd.; Noranda Technology Centre, Dofasco Inc., Domfer Metal Powders Ltd. of Quebec, Pulp and Paper Research Institute, Canadian Marconi Company.

R&D Projects

Microstructural characterization of various types of steel used in the automobile industry and other industries to trace their manufacturing processes. Development and characterization of metal-matrix composite materials.

Special R&D Facilities

Two transmission electron microscopes (JEOL 2000 FX/200KV, Philips CM 30/300KV) with X-ray spectrometer and EELS. Two scanning electron microscopes (JEOL JSM-820 et JSM-840) with X-ray spectrometer. Auger scanning electron microscope (JEOL JAM D-30) with SIMS attachment. Image analysis system (Zeiss IBAS). X-ray diffractometer (Philips PW 1130). Floor Space Devoted to R&D: 265 m^2.

École Polytechnique de Montréal
Centre de recherche appliquée sur les polymères (CRASP)

P.O. Box 6079, Station A
MONTREAL, Que.
H3C 3A7

Date of Response: July 26, 1990
Contact: Pierre Carreau
Title: Director
Phone: (514) 340-4924
Fax: (514) 340-4159

Organization Type	
Government Laboratory	
Technology Centre	
Community College	
University	Yes
Industrial Company	
Other (including Consulting)	

Total Staffing	
1-24 Employees	
25-99 Employees	Yes
100-499 Employees	
500-999 Employees	
1 000+ Employees	
Total Staff	28

R&D Staffing	
Doctorate Level	16
Master's Level	18
Bachelor's Level	21
Technologists	4
Total R&D Staff	25

Type of R&D Performed	
Research	Yes
Product Design	
Manufacturing Processes	Yes
Industrial Engineering	
Plant and Env. Hazards Eng.	
Test and Evaluation	

Vehicle Applicability	
Alternate and Multifuel	
Electric and Hybrid	
Cars and Vans	
Off-road Vehicles	
Trucks, Buses, Trailers	
Specialty Vehicles	

Manufacturing Process Expertise	
Metal Manufacturing Processes	
Plastics Manufacturing Processes	10
Mfg. Machinery and Equipment	
Robotics	
Other Manufacturing Processes	

Knowledge Specialty	
Aero and Fluid Dynamics	
CAD, CAM, CIM	
Finite Element Analysis	5
Fuels and Lubricants	
Ergonomics and Industrial Design	
Joining and Fastening	
Materials: Ferrous Metals	
Materials: Non-ferrous Metals	
Materials: Plastics	10
Materials: Composites	10
Materials: Rubber	
Materials: Glass	
Materials: Electrical/Electronic	
Finishes and Coatings	
Noise and Vibration	
Simulation and Modelling	
Stress/Strain/Stiffness	
Systems Integration	
Other	

Automotive Component Specialty	
Body and Structure	7
Electrical System	
Engines	
Emission Controls	
Heating, Ventilation and A/C	
Instruments and Controls	
Interior Trim and Components	
Steering, Suspension, Brakes	
Transmission	
Safety	
Wheels and Tires	
Diagnostic and Service Equipment	

Affiliations With Other Organizations
CQIP — plastics and composites.

R&D Projects
Rheology and study of injection moulding of fibreglass-reinforced thermoplastics. Study of high-performance composites, carbon-glass hybrid composites, characterization of plastic gear assemblies and modelling of their behaviour. Morphological and rheological study of polymer alloys.

Special R&D Facilities
Laboratory for forming of plastics, extrusion, film enlarging, sectioning, injection moulding, resin transfer moulding, piston extrusion, forging with microwave heating, characterization devices, rheometres, devices for traction, fatigue, Dynatop instrumented impact, DSC and DMA analyzer, injection and set piece analysis software. Floor Space Devoted to R&D: 615 m^2.

Environment Canada
Vehicle Emissions Test Laboratory

OTTAWA, Ont.
K1A 0H3

Date of Response: March 26, 1990
Contact: Fred Hendren
Title: Manager
Phone: (613) 998-9590
Fax: (613) 998-0004

Organization Type

Government Laboratory	Yes
Technology Centre	
Community College	
University	
Industrial Company	
Other (including Consulting)	

Total Staffing

1-24 Employees	Yes
25-99 Employees	
100-499 Employees	
500-999 Employees	
1 000+ Employees	
Total Staff	18

R&D Staffing

Doctorate Level	
Master's Level	1
Bachelor's Level	4
Technologists	3
Total R&D Staff	7

Type of R&D Performed

Research	Yes
Product Design	
Manufacturing Processes	
Industrial Engineering	
Plant and Env. Hazards Eng.	
Test and Evaluation	

Vehicle Applicability

Alternate and Multifuel	Yes
Electric and Hybrid	Yes
Cars and Vans	
Off-road Vehicles	Yes
Trucks, Buses, Trailers	Yes
Specialty Vehicles	

Manufacturing Process Expertise

Metal Manufacturing Processes	
Plastics Manufacturing Processes	
Mfg. Machinery and Equipment	
Robotics	
Other Manufacturing Processes	

Knowledge Specialty

Aero and Fluid Dynamics
CAD, CAM, CIM
Finite Element Analysis
Fuels and Lubricants
Ergonomics and Industrial Design
Joining and Fastening
Materials: Ferrous Metals
Materials: Non-ferrous Metals
Materials: Plastics
Materials: Composites
Materials: Rubber
Materials: Glass
Materials: Electrical/Electronic
Finishes and Coatings
Noise and Vibration
Simulation and Modelling
Stress/Strain/Stiffness
Systems Integration
Other

Automotive Component Specialty

Body and Structure	
Electrical System	
Engines	5
Emission Controls	5
Heating, Ventilation and A/C	
Instruments and Controls	
Interior Trim and Components	
Steering, Suspension, Brakes	
Transmission	
Safety	
Wheels and Tires	
Diagnostic and Service Equipment	

Affiliations With Other Organizations

Joint venture partners include other governments, automobile manufacturers, universities, private industry (development of emission components).

R&D Projects

Investigation of electric vehicle performance and emissions. Characterization of heavy vehicle exhaust. Hybrid fuels testing. Alternative fuels in both light and heavy duty vehicles.

Special R&D Facilities

Heavy duty vehicle chassis dynamometer (one-axle). On-road raw exhaust sampling system. Light duty vehicle chassis dynamometer. Sealed housing for evaporative emissions. Organic analysis instrumentation; gas chromatography, high-precision liquid chromatography, GC mass selective detectors. Double dilution tunnel for non-regulated emissions analysis. Floor Space Devoted to R&D: 300 m^2.

F.E.L. Consultants Limited

Suite 600
789 Don Mills Road
DON MILLS, Ont.
M3C 1T5

Date of Response: **March 22, 1990**
Contact: **Mr. Jan M. Melchers, P.Eng.**
Title: **President**
Phone: **(416) 422-4056**
Fax: **(416) 422-4638**

Organization Type	
Government Laboratory	
Technology Centre	
Community College	
University	
Industrial Company	
Other (including Consulting)	Yes

Total Staffing	
1-24 Employees	Yes
25-99 Employees	
100-499 Employees	
500-999 Employees	
1 000+ Employees	
Total Staff	20

R&D Staffing	
Doctorate Level	
Master's Level	
Bachelor's Level	2
Technologists	
Total R&D Staff	2

Type of R&D Performed	
Research	Yes
Product Design	
Manufacturing Processes	Yes
Industrial Engineering	Yes
Plant and Env. Hazards Eng.	Yes
Test and Evaluation	

Vehicle Applicability	
Alternate and Multifuel	
Electric and Hybrid	
Cars and Vans	
Off-road Vehicles	
Trucks, Buses, Trailers	
Specialty Vehicles	

Manufacturing Process Expertise
Metal Manufacturing Processes
Plastics Manufacturing Processes
Mfg. Machinery and Equipment
Robotics
Other Manufacturing Processes

Knowledge Specialty	
Aero and Fluid Dynamics	
CAD, CAM, CIM	
Finite Element Analysis	
Fuels and Lubricants	
Ergonomics and Industrial Design	
Joining and Fastening	
Materials: Ferrous Metals	
Materials: Non-ferrous Metals	
Materials: Plastics	
Materials: Composites	
Materials: Rubber	
Materials: Glass	
Materials: Electrical/Electronic	
Finishes and Coatings	
Noise and Vibration	
Simulation and Modelling	
Stress/Strain/Stiffness	
Systems Integration	
Other	9

Automotive Component Specialty
Body and Structure
Electrical System
Engines
Emission Controls
Heating, Ventilation and A/C
Instruments and Controls
Interior Trim and Components
Steering, Suspension, Brakes
Transmission
Safety
Wheels and Tires
Diagnostic and Service Equipment

Affiliations With Other Organizations

None Reported.

R&D Projects

Clean room facilities for part assemblies such as air bag devices, bearing assemblies, paint facilities. Building services for automotive and parts plants. Industrial engineering services and studies for the automotive industry.

Special R&D Facilities

Floor Space Devoted to R&D: Not Reported.

F.T. Gerson Limited

55 Queen Street East
TORONTO, Ont.
M5C 1R6

Date of Response: **March 22, 1990**
Contact: **Ted Gerson**
Title: **President**
Phone: **(416) 364-2457**
Fax: **(416) 364-2458**

Organization Type

Government Laboratory	
Technology Centre	
Community College	
University	
Industrial Company	
Other (including Consulting)	Yes

Total Staffing

1-24 Employees	Yes
25-99 Employees	
100-499 Employees	
500-999 Employees	
1 000+ Employees	
Total Staff	4

R&D Staffing

Doctorate Level	
Master's Level	1
Bachelor's Level	2
Technologists	
Total R&D Staff	

Type of R&D Performed

Research	Yes
Product Design	Yes
Manufacturing Processes	Yes
Industrial Engineering	
Plant and Env. Hazards Eng.	
Test and Evaluation	Yes

Vehicle Applicability

Alternate and Multifuel	
Electric and Hybrid	Yes
Cars and Vans	Yes
Off-road Vehicles	Yes
Trucks, Buses, Trailers	Yes
Specialty Vehicles	Yes

Manufacturing Process Expertise

Metal Manufacturing Processes	9
Plastics Manufacturing Processes	10
Mfg. Machinery and Equipment	8
Robotics	
Other Manufacturing Processes	8

Knowledge Specialty

Aero and Fluid Dynamics	
CAD, CAM, CIM	
Finite Element Analysis	
Fuels and Lubricants	
Ergonomics and Industrial Design	7
Joining and Fastening	7
Materials: Ferrous Metals	8
Materials: Non-ferrous Metals	9
Materials: Plastics	10
Materials: Composites	10
Materials: Rubber	5
Materials: Glass	5
Materials: Electrical/Electronic	5
Finishes and Coatings	9
Noise and Vibration	
Simulation and Modelling	3
Stress/Strain/Stiffness	8
Systems Integration	7
Other	8

Automotive Component Specialty

Body and Structure	9
Electrical System	6
Engines	6
Emission Controls	6
Heating, Ventilation and A/C	6
Instruments and Controls	6
Interior Trim and Components	8
Steering, Suspension, Brakes	3
Transmission	6
Safety	6
Wheels and Tires	4
Diagnostic and Service Equipment	5

Affiliations With Other Organizations

None Reported.

R&D Projects

Reviews and forecasts for non-ferrous metals, composites, plastics, alloys. Development of preforms and prepregs; SRIM, RRIM, RIM, SMC, BMC, TMC. HSLA stamping. Ferrous and non-ferrous mould alloys. PVD; ion implantation; surface conversion.

Special R&D Facilities

Materials engineering data bases established during the 30-year period since the firm was established (1960). Charting and forecasting consumption and utilization growth. New products and processes in polymer-based composites. Floor Space Devoted to R&D: Not Reported.

Fiberglas Canada Inc.

165 York Road
GUELPH, Ont.
N1E 3G1

Date of Response: March 21, 1990
Contact: E.J. MacPherson
Title: Manager, Research and Development
Phone: (519) 824-0120
Fax: (519) 824-3773

Organization Type	
Government Laboratory	
Technology Centre	
Community College	
University	
Industrial Company	Yes
Other (including Consulting)	

Total Staffing	
1-24 Employees	Yes
25-99 Employees	
100-499 Employees	
500-999 Employees	
1 000+ Employees	
Total Staff	23

R&D Staffing	
Doctorate Level	4
Master's Level	1
Bachelor's Level	7
Technologists	2
Total R&D Staff	23

Type of R&D Performed	
Research	Yes
Product Design	Yes
Manufacturing Processes	
Industrial Engineering	
Plant and Env. Hazards Eng.	
Test and Evaluation	Yes

Vehicle Applicability	
Alternate and Multifuel	
Electric and Hybrid	
Cars and Vans	Yes
Off-road Vehicles	Yes
Trucks, Buses, Trailers	Yes
Specialty Vehicles	Yes

Manufacturing Process Expertise	
Metal Manufacturing Processes	
Plastics Manufacturing Processes	8
Mfg. Machinery and Equipment	
Robotics	
Other Manufacturing Processes	

Knowledge Specialty	
Aero and Fluid Dynamics	
CAD, CAM, CIM	
Finite Element Analysis	
Fuels and Lubricants	
Ergonomics and Industrial Design	
Joining and Fastening	
Materials: Ferrous Metals	
Materials: Non-ferrous Metals	
Materials: Plastics	5
Materials: Composites	5
Materials: Rubber	
Materials: Glass	5
Materials: Electrical/Electronic	
Finishes and Coatings	
Noise and Vibration	
Simulation and Modelling	
Stress/Strain/Stiffness	
Systems Integration	
Other	

Automotive Component Specialty	
Body and Structure	5
Electrical System	
Engines	
Emission Controls	
Heating, Ventilation and A/C	
Instruments and Controls	
Interior Trim and Components	
Steering, Suspension, Brakes	
Transmission	
Safety	
Wheels and Tires	
Diagnostic and Service Equipment	

Affiliations With Other Organizations

Owens Corning Fiberglas Corporation.

R&D Projects

Development of glass reinforcements for automotive and transportation applications.

Special R&D Facilities

Press moulding of sheet and bulk moulding compounds. Composite testing lab. Thermoplastic processing. Thermoset processing. Floor Space Devoted to R&D: 3 000 m^2.

Forensic Engineering

1022 Waterdown Road
BURLINGTON, Ont.
L7T 1N3

Date of Response: March 30, 1990
Contact: Harold J. Wilkinson
Title: President
Phone: (416) 632-3040
Fax: (416) 632-2131

Organization Type

Government Laboratory
Technology Centre
Community College
University
Industrial Company
Other (including Consulting) Yes

Total Staffing

1-24 Employees Yes
25-99 Employees
100-499 Employees
500-999 Employees
1 000+ Employees
Total Staff 18

R&D Staffing

Doctorate Level
Master's Level
Bachelor's Level
Technologists
Total R&D Staff

Type of R&D Performed

Research
Product Design
Manufacturing Processes
Industrial Engineering
Plant and Env. Hazards Eng.
Test and Evaluation

Vehicle Applicability

Alternate and Multifuel
Electric and Hybrid
Cars and Vans
Off-road Vehicles
Trucks, Buses, Trailers
Specialty Vehicles

Manufacturing Process Expertise

Metal Manufacturing Processes
Plastics Manufacturing Processes
Mfg. Machinery and Equipment
Robotics
Other Manufacturing Processes

Knowledge Specialty

Aero and Fluid Dynamics
CAD, CAM, CIM
Finite Element Analysis
Fuels and Lubricants
Ergonomics and Industrial Design
Joining and Fastening
Materials: Ferrous Metals
Materials: Non-ferrous Metals
Materials: Plastics
Materials: Composites
Materials: Rubber
Materials: Glass
Materials: Electrical/Electronic
Finishes and Coatings
Noise and Vibration
Simulation and Modelling
Stress/Strain/Stiffness
Systems Integration
Other 10

Automotive Component Specialty

Body and Structure
Electrical System
Engines
Emission Controls
Heating, Ventilation and A/C
Instruments and Controls
Interior Trim and Components
Steering, Suspension, Brakes
Transmission
Safety
Wheels and Tires
Diagnostic and Service Equipment

Affiliations With Other Organizations

None Reported.

R&D Projects

Have been working on computer simulation of fires and associated graphics for three years. Special knowledge area is accidents and fires.

Special R&D Facilities

Floor Space Devoted to R&D: Not Reported.

Forming Technologies Incorporated

1075 North Service Road West
OAKVILLE, Ont.
L6M 2G2

Date of Response: July 23, 1990
Contact: K.H. Jones
Title: President
Phone: (416) 827-2997
Fax: (416) 827-3166

Organization Type	
Government Laboratory	
Technology Centre	
Community College	
University	
Industrial Company	
Other (including Consulting)	Yes

Total Staffing	
1-24 Employees	Yes
25-99 Employees	
100-499 Employees	
500-999 Employees	
1 000+ Employees	
Total Staff	16

R&D Staffing	
Doctorate Level	7
Master's Level	3
Bachelor's Level	2
Technologists	1
Total R&D Staff	13

Type of R&D Performed	
Research	
Product Design	
Manufacturing Processes	Yes
Industrial Engineering	
Plant and Env. Hazards Eng.	
Test and Evaluation	

Vehicle Applicability	
Alternate and Multifuel	Yes
Electric and Hybrid	Yes
Cars and Vans	Yes
Off-road Vehicles	Yes
Trucks, Buses, Trailers	Yes
Specialty Vehicles	Yes

Manufacturing Process Expertise	
Metal Manufacturing Processes	10
Plastics Manufacturing Processes	
Mfg. Machinery and Equipment	
Robotics	
Other Manufacturing Processes	5

Knowledge Specialty	
Aero and Fluid Dynamics	
CAD, CAM, CIM	5
Finite Element Analysis	8
Fuels and Lubricants	
Ergonomics and Industrial Design	
Joining and Fastening	
Materials: Ferrous Metals	5
Materials: Non-ferrous Metals	
Materials: Plastics	
Materials: Composites	
Materials: Rubber	
Materials: Glass	
Materials: Electrical/Electronic	
Finishes and Coatings	
Noise and Vibration	
Simulation and Modelling	6
Stress/Strain/Stiffness	5
Systems Integration	
Other	

Automotive Component Specialty	
Body and Structure	6
Electrical System	
Engines	
Emission Controls	
Heating, Ventilation and A/C	
Instruments and Controls	
Interior Trim and Components	
Steering, Suspension, Brakes	
Transmission	
Safety	
Wheels and Tires	
Diagnostic and Service Equipment	

Affiliations With Other Organizations

Major contracts from Formtech Inc., a consortium of Canadian steel companies and automotive stamping companies. Manufacturing Research Corporation of Ontario (MRCO).

R&D Projects

Metal stamping engineering and die design: to develop mathematical models of metal forming expressed in a form that can be applied by industry using personal computers; applicable to metal stamping product design, process design, tooling design, material selection, production operations. Contract research in problem-solving on stamping.

Special R&D Facilities

Networked advanced capability computers. Floor Space Devoted to R&D: 480 m^2.

Gad Shaanan Designs Inc.

Suite 390
2455 Manella Road
MONTREAL, Que.
H4P 2A5

Date of Response: April 5, 1990
Contact: Mr Gad Shaanan
Title: President
Phone: (514) 735-9550
Fax: (514) 735-3961

Organization Type

Government Laboratory	
Technology Centre	
Community College	
University	
Industrial Company	
Other (including Consulting)	Yes

Total Staffing

1-24 Employees	Yes
25-99 Employees	
100-499 Employees	
500-999 Employees	
1 000+ Employees	
Total Staff	15

R&D Staffing

Doctorate Level	
Master's Level	
Bachelor's Level	9
Technologists	1
Total R&D Staff	13

Type of R&D Performed

Research	
Product Design	Yes
Manufacturing Processes	
Industrial Engineering	
Plant and Env. Hazards Eng.	
Test and Evaluation	

Vehicle Applicability

Alternate and Multifuel	
Electric and Hybrid	
Cars and Vans	Yes
Off-road Vehicles	Yes
Trucks, Buses, Trailers	Yes
Specialty Vehicles	Yes

Manufacturing Process Expertise

Metal Manufacturing Processes	9
Plastics Manufacturing Processes	9
Mfg. Machinery and Equipment	7
Robotics	
Other Manufacturing Processes	

Knowledge Specialty

Aero and Fluid Dynamics	
CAD, CAM, CIM	
Finite Element Analysis	
Fuels and Lubricants	
Ergonomics and Industrial Design	10
Joining and Fastening	
Materials: Ferrous Metals	7
Materials: Non-ferrous Metals	7
Materials: Plastics	9
Materials: Composites	4
Materials: Rubber	6
Materials: Glass	6
Materials: Electrical/Electronic	4
Finishes and Coatings	4
Noise and Vibration	3
Simulation and Modelling	9
Stress/Strain/Stiffness	
Systems Integration	
Other	

Automotive Component Specialty

Body and Structure	9
Electrical System	
Engines	
Emission Controls	
Heating, Ventilation and A/C	
Instruments and Controls	9
Interior Trim and Components	9
Steering, Suspension, Brakes	
Transmission	
Safety	
Wheels and Tires	
Diagnostic and Service Equipment	

Affiliations With Other Organizations

None Reported.

R&D Projects

None Reported.

Special R&D Facilities

CAD system. Model shop. Floor Space Devoted to R&D: Not Reported.

Gates Power Drive Products Inc.

3303 St. Etienne Blvd.
WINDSOR, Ont.
N8W 5B1

Date of Response: March 23, 1990
Contact: Harry Thomey
Title: Vice President, Engineering
Phone: (519) 945-4200

Organization Type	
Government Laboratory	
Technology Centre	
Community College	
University	
Industrial Company	Yes
Other (including Consulting)	

Total Staffing	
1-24 Employees	
25-99 Employees	
100-499 Employees	Yes
500-999 Employees	
1 000+ Employees	
Total Staff	450

R&D Staffing	
Doctorate Level	2
Master's Level	2
Bachelor's Level	15
Technologists	36
Total R&D Staff	60

Type of R&D Performed	
Research	Yes
Product Design	Yes
Manufacturing Processes	
Industrial Engineering	
Plant and Env. Hazards Eng.	
Test and Evaluation	Yes

Vehicle Applicability	
Alternate and Multifuel	
Electric and Hybrid	
Cars and Vans	Yes
Off-road Vehicles	
Trucks, Buses, Trailers	Yes
Specialty Vehicles	

Manufacturing Process Expertise	
Metal Manufacturing Processes	8
Plastics Manufacturing Processes	3
Mfg. Machinery and Equipment	
Robotics	
Other Manufacturing Processes	

Knowledge Specialty	
Aero and Fluid Dynamics	
CAD, CAM, CIM	7
Finite Element Analysis	8
Fuels and Lubricants	
Ergonomics and Industrial Design	
Joining and Fastening	2
Materials: Ferrous Metals	3
Materials: Non-ferrous Metals	3
Materials: Plastics	3
Materials: Composites	
Materials: Rubber	
Materials: Glass	
Materials: Electrical/Electronic	
Finishes and Coatings	
Noise and Vibration	7
Simulation and Modelling	10
Stress/Strain/Stiffness	7
Systems Integration	7
Other	

Automotive Component Specialty	
Body and Structure	
Electrical System	
Engines	
Emission Controls	
Heating, Ventilation and A/C	
Instruments and Controls	
Interior Trim and Components	
Steering, Suspension, Brakes	
Transmission	10
Safety	
Wheels and Tires	
Diagnostic and Service Equipment	

Affiliations With Other Organizations

SAE accessory drive committee.

R&D Projects

Belt drive systems research and design.

Special R&D Facilities

Computer models for belt drives. Data acquisition and analysis programs. Special belt drive measurement equipment. Electrodynmanic shakers and FFT analyzers. Dynamometer. Specialized test machines for belt drive components. CAD 2D, 3D and finite element analysis. Floor Space Devoted to R&D: 700 m^2.

General Kinetics Engineering Corp.

110 East Drive
BRAMALEA, Ont.
L6T 1C1

Date of Response: April 19, 1990
Contact: Mr. Eric Williams
Title: Vice President, Sales
Phone: (416) 458-0888
Fax: (416) 458-7566

Organization Type

Government Laboratory	
Technology Centre	
Community College	
University	
Industrial Company	Yes
Other (including Consulting)	

Total Staffing

1-24 Employees	
25-99 Employees	Yes
100-499 Employees	
500-999 Employees	
1 000+ Employees	
Total Staff	

R&D Staffing

Doctorate Level	
Master's Level	3
Bachelor's Level	3
Technologists	5
Total R&D Staff	15

Type of R&D Performed

Research	
Product Design	Yes
Manufacturing Processes	Yes
Industrial Engineering	Yes
Plant and Env. Hazards Eng.	
Test and Evaluation	Yes

Vehicle Applicability

Alternate and Multifuel	
Electric and Hybrid	
Cars and Vans	
Off-road Vehicles	Yes
Trucks, Buses, Trailers	Yes
Specialty Vehicles	Yes

Manufacturing Process Expertise

Metal Manufacturing Processes	7
Plastics Manufacturing Processes	
Mfg. Machinery and Equipment	7
Robotics	2
Other Manufacturing Processes	

Knowledge Specialty

Aero and Fluid Dynamics	10
CAD, CAM, CIM	3
Finite Element Analysis	
Fuels and Lubricants	5
Ergonomics and Industrial Design	
Joining and Fastening	8
Materials: Ferrous Metals	5
Materials: Non-ferrous Metals	5
Materials: Plastics	5
Materials: Composites	
Materials: Rubber	5
Materials: Glass	
Materials: Electrical/Electronic	5
Finishes and Coatings	5
Noise and Vibration	5
Simulation and Modelling	5
Stress/Strain/Stiffness	5
Systems Integration	
Other	

Automotive Component Specialty

Body and Structure	
Electrical System	
Engines	
Emission Controls	
Heating, Ventilation and A/C	
Instruments and Controls	
Interior Trim and Components	
Steering, Suspension, Brakes	10
Transmission	
Safety	
Wheels and Tires	
Diagnostic and Service Equipment	

Affiliations With Other Organizations

Government of the United States. Government of Japan.

R&D Projects

Off-road performance improvement as related to shock absorbers. Gun platform stabilization on tanks as related to shock absorbers.

Special R&D Facilities

Two servo hydraulic dynamometers. Impact test equipment with 8 000-Nm capacity. Floor Space Devoted to R&D: 900 m^2.

Global Sensor Systems Inc.

1435-25 Bonhill Road
MISSISSAUGA, Ont.
L5T 1V2

Date of Response: March 26, 1990
Contact: Ray H. Glenn
Title: Director of Marketing
Phone: (416) 564-3090
Fax: (416) 670-1414

Organization Type

Government Laboratory	
Technology Centre	
Community College	
University	
Industrial Company	Yes
Other (including Consulting)	

Total Staffing

1-24 Employees	
25-99 Employees	
100-499 Employees	
500-999 Employees	
1 000+ Employees	
Total Staff	

R&D Staffing

Doctorate Level	
Master's Level	
Bachelor's Level	
Technologists	
Total R&D Staff	

Type of R&D Performed

Research	
Product Design	Yes
Manufacturing Processes	
Industrial Engineering	
Plant and Env. Hazards Eng.	
Test and Evaluation	

Vehicle Applicability

Alternate and Multifuel	
Electric and Hybrid	
Cars and Vans	
Off-road Vehicles	
Trucks, Buses, Trailers	Yes
Specialty Vehicles	

Manufacturing Process Expertise

Metal Manufacturing Processes	
Plastics Manufacturing Processes	
Mfg. Machinery and Equipment	
Robotics	
Other Manufacturing Processes	

Knowledge Specialty

Aero and Fluid Dynamics	
CAD, CAM, CIM	
Finite Element Analysis	
Fuels and Lubricants	
Ergonomics and Industrial Design	
Joining and Fastening	
Materials: Ferrous Metals	
Materials: Non-ferrous Metals	
Materials: Plastics	
Materials: Composites	
Materials: Rubber	
Materials: Glass	
Materials: Electrical/Electronic	10
Finishes and Coatings	
Noise and Vibration	
Simulation and Modelling	
Stress/Strain/Stiffness	
Systems Integration	
Other	

Automotive Component Specialty

Body and Structure	
Electrical System	
Engines	
Emission Controls	
Heating, Ventilation and A/C	
Instruments and Controls	
Interior Trim and Components	
Steering, Suspension, Brakes	
Transmission	
Safety	10
Wheels and Tires	
Diagnostic and Service Equipment	

Affiliations With Other Organizations

None Reported.

R&D Projects

None Reported.

Special R&D Facilities

Floor Space Devoted to R&D: Not Reported.

Glos Engineering Ltd.

3155 Huron Church Road
WINDSOR, Ont.
N9E 4H6

Date of Response: March 28, 1990
Contact: Carl M. Glos, P.Eng.
Title: President and Chief Engineer
Phone: (519) 966-6750
Fax: (519) 966-6753

Organization Type	
Government Laboratory	
Technology Centre	
Community College	
University	
Industrial Company	
Other (including Consulting)	Yes

Total Staffing	
1-24 Employees	Yes
25-99 Employees	
100-499 Employees	
500-999 Employees	
1 000+ Employees	
Total Staff	18

R&D Staffing	
Doctorate Level	
Master's Level	
Bachelor's Level	7
Technologists	7
Total R&D Staff	14

Type of R&D Performed	
Research	
Product Design	
Manufacturing Processes	
Industrial Engineering	Yes
Plant and Env. Hazards Eng.	Yes
Test and Evaluation	

Vehicle Applicability	
Alternate and Multifuel	
Electric and Hybrid	
Cars and Vans	
Off-road Vehicles	
Trucks, Buses, Trailers	
Specialty Vehicles	

Manufacturing Process Expertise	
Metal Manufacturing Processes	3
Plastics Manufacturing Processes	3
Mfg. Machinery and Equipment	3
Robotics	1
Other Manufacturing Processes	

Knowledge Specialty	
Aero and Fluid Dynamics	7
CAD, CAM, CIM	10
Finite Element Analysis	3
Fuels and Lubricants	3
Ergonomics and Industrial Design	7
Joining and Fastening	
Materials: Ferrous Metals	7
Materials: Non-ferrous Metals	7
Materials: Plastics	7
Materials: Composites	3
Materials: Rubber	3
Materials: Glass	3
Materials: Electrical/Electronic	8
Finishes and Coatings	10
Noise and Vibration	7
Simulation and Modelling	5
Stress/Strain/Stiffness	3
Systems Integration	3
Other	

Automotive Component Specialty	
Body and Structure	
Electrical System	
Engines	
Emission Controls	
Heating, Ventilation and A/C	10
Instruments and Controls	10
Interior Trim and Components	3
Steering, Suspension, Brakes	
Transmission	
Safety	
Wheels and Tires	
Diagnostic and Service Equipment	

Affiliations With Other Organizations

APEO, ACEC, CEO, RAIC, OAA, ASHRAE, WPCF, PCAO, ACI, CSCF.

R&D Projects

General Motors waste treatment facilities, General Motors transmission plant (Windsor), Chrysler Canada potable water, Dinoc facility, CN Rail auto transit yards, Wayne Canada bus plant.

Special R&D Facilities

Floor Space Devoted to R&D: Not Reported.

Goshen Rubber of Canada Limited

100 Stafford Drive
BRAMPTON, Ont.
L6W 1L4

Date of Response: **March 20, 1990**
Contact: **Mr. W.B. Parkhouse**
Title: **General Manager**
Phone: **(416) 457-5843**
Fax: **(416) 457-4373**

Organization Type

Government Laboratory	
Technology Centre	
Community College	
University	
Industrial Company	Yes
Other (including Consulting)	

Total Staffing

1-24 Employees	
25-99 Employees	Yes
100-499 Employees	
500-999 Employees	
1 000+ Employees	
Total Staff	68

R&D Staffing

Doctorate Level	
Master's Level	
Bachelor's Level	5
Technologists	5
Total R&D Staff	10

Type of R&D Performed

Research	Yes
Product Design	Yes
Manufacturing Processes	Yes
Industrial Engineering	Yes
Plant and Env. Hazards Eng.	Yes
Test and Evaluation	Yes

Vehicle Applicability

Alternate and Multifuel	
Electric and Hybrid	
Cars and Vans	Yes
Off-road Vehicles	Yes
Trucks, Buses, Trailers	
Specialty Vehicles	

Manufacturing Process Expertise

Metal Manufacturing Processes	3
Plastics Manufacturing Processes	5
Mfg. Machinery and Equipment	7
Robotics	6
Other Manufacturing Processes	10

Knowledge Specialty

Aero and Fluid Dynamics	6
CAD, CAM, CIM	8
Finite Element Analysis	
Fuels and Lubricants	
Ergonomics and Industrial Design	4
Joining and Fastening	1
Materials: Ferrous Metals	
Materials: Non-ferrous Metals	
Materials: Plastics	7
Materials: Composites	
Materials: Rubber	10
Materials: Glass	
Materials: Electrical/Electronic	
Finishes and Coatings	
Noise and Vibration	
Simulation and Modelling	
Stress/Strain/Stiffness	
Systems Integration	
Other	

Automotive Component Specialty

Body and Structure	
Electrical System	
Engines	10
Emission Controls	
Heating, Ventilation and A/C	7
Instruments and Controls	
Interior Trim and Components	
Steering, Suspension, Brakes	8
Transmission	9
Safety	
Wheels and Tires	
Diagnostic and Service Equipment	

Affiliations With Other Organizations

Goshen Rubber Co. Inc., Goshen, Indiana. GSH Corp., Snowhill, North Carolina.

R&D Projects

Special requirement rubber formulations development. Materials testing and analysis. Machinery development and building.

Special R&D Facilities

Floor Space Devoted to R&D: Not Reported.

Hawtal Whiting of Canada Ltd.

1100 University Avenue West
WINDSOR, Ont.
N9A 5S7

Date of Response: April 2, 1990
Contact: Peter Childs
Title: President and Operations Manager
Phone: (519) 253-2454
Fax: (519) 253-9698

Organization Type

Government Laboratory	
Technology Centre	
Community College	
University	
Industrial Company	
Other (including Consulting)	Yes

Total Staffing

1-24 Employees	
25-99 Employees	Yes
100-499 Employees	
500-999 Employees	
1 000+ Employees	
Total Staff	90

R&D Staffing

Doctorate Level	1
Master's Level	6
Bachelor's Level	16
Technologists	1100
Total R&D Staff	1100

Type of R&D Performed

Research	
Product Design	Yes
Manufacturing Processes	Yes
Industrial Engineering	
Plant and Env. Hazards Eng.	
Test and Evaluation	Yes

Vehicle Applicability

Alternate and Multifuel	
Electric and Hybrid	
Cars and Vans	Yes
Off-road Vehicles	
Trucks, Buses, Trailers	Yes
Specialty Vehicles	Yes

Manufacturing Process Expertise

Metal Manufacturing Processes
Plastics Manufacturing Processes
Mfg. Machinery and Equipment
Robotics
Other Manufacturing Processes

Knowledge Specialty

Aero and Fluid Dynamics	
CAD, CAM, CIM	5
Finite Element Analysis	10
Fuels and Lubricants	
Ergonomics and Industrial Design	
Joining and Fastening	
Materials: Ferrous Metals	
Materials: Non-ferrous Metals	
Materials: Plastics	
Materials: Composites	
Materials: Rubber	
Materials: Glass	
Materials: Electrical/Electronic	
Finishes and Coatings	
Noise and Vibration	
Simulation and Modelling	5
Stress/Strain/Stiffness	8
Systems Integration	
Other	

Automotive Component Specialty

Body and Structure	10
Electrical System	7
Engines	
Emission Controls	
Heating, Ventilation and A/C	7
Instruments and Controls	
Interior Trim and Components	10
Steering, Suspension, Brakes	7
Transmission	
Safety	5
Wheels and Tires	5
Diagnostic and Service Equipment	

Affiliations With Other Organizations

Note: staff number of 1 100 refers to world-wide staff.

R&D Projects

None Reported.

Special R&D Facilities

Design and engineering, CAD, CAE, finite element analysis. Model and prototype building and testing operations. Floor Space Devoted to R&D: 28 000 m^2 (world-wide).

Hematite Manufacturing

659 Speedvale Avenue West
GUELPH, Ont.
N1K 1E6

Date of Response: March 28, 1990
Contact: Jerry Jean
Title: Director of Corporate Development
Phone: (519) 823-1141
Fax: (519) 823-1477

Organization Type	
Government Laboratory	
Technology Centre	
Community College	
University	
Industrial Company	Yes
Other (including Consulting)	

Total Staffing	
1-24 Employees	
25-99 Employees	
100-499 Employees	Yes
500-999 Employees	
1 000+ Employees	
Total Staff	110

R&D Staffing	
Doctorate Level	
Master's Level	
Bachelor's Level	3
Technologists	2
Total R&D Staff	5

Type of R&D Performed	
Research	
Product Design	Yes
Manufacturing Processes	Yes
Industrial Engineering	
Plant and Env. Hazards Eng.	
Test and Evaluation	Yes

Vehicle Applicability	
Alternate and Multifuel	
Electric and Hybrid	
Cars and Vans	Yes
Off-road Vehicles	
Trucks, Buses, Trailers	
Specialty Vehicles	

Manufacturing Process Expertise	
Metal Manufacturing Processes	
Plastics Manufacturing Processes	8
Mfg. Machinery and Equipment	
Robotics	
Other Manufacturing Processes	7

Knowledge Specialty	
Aero and Fluid Dynamics	
CAD, CAM, CIM	7
Finite Element Analysis	
Fuels and Lubricants	
Ergonomics and Industrial Design	
Joining and Fastening	
Materials: Ferrous Metals	
Materials: Non-ferrous Metals	
Materials: Plastics	8
Materials: Composites	
Materials: Rubber	
Materials: Glass	
Materials: Electrical/Electronic	
Finishes and Coatings	
Noise and Vibration	9
Simulation and Modelling	
Stress/Strain/Stiffness	
Systems Integration	
Other	

Automotive Component Specialty	
Body and Structure	
Electrical System	
Engines	
Emission Controls	
Heating, Ventilation and A/C	
Instruments and Controls	
Interior Trim and Components	7
Steering, Suspension, Brakes	
Transmission	
Safety	
Wheels and Tires	
Diagnostic and Service Equipment	

Affiliations With Other Organizations

A Division of Pavaco Plastics. See Pavaco Plastics entry for more information.

R&D Projects

Low fog PVC material development. Reclaim of PVC scrap for use in Hematite-proprietary blend

Special R&D Facilities

Material development lab with two roll mill, oven tensile, specific gravity and durometer testing devices. Sound intensity analysis lab with B&K sound intensity analysis equipment. Two CAD stations for product development and equipment design. Floor Space Devoted to R&D: Not Reported.

Hoemsen and Associates

2 Point Road
WINNIPEG, Man.
R3T 1C9

Date of Response: April 18, 1990
Contact: Ray Hoemsen, P.Eng.
Title: President
Phone: (204) 453-3589
Fax: (204) 452-2612

Organization Type

Government Laboratory	
Technology Centre	
Community College	
University	
Industrial Company	
Other (including Consulting)	Yes

Total Staffing

1-24 Employees	Yes
25-99 Employees	
100-499 Employees	
500-999 Employees	
1 000+ Employees	
Total Staff	2

R&D Staffing

Doctorate Level	
Master's Level	1
Bachelor's Level	1
Technologists	
Total R&D Staff	1

Type of R&D Performed

Research	Yes
Product Design	Yes
Manufacturing Processes	
Industrial Engineering	
Plant and Env. Hazards Eng.	
Test and Evaluation	Yes

Vehicle Applicability

Alternate and Multifuel	
Electric and Hybrid	
Cars and Vans	
Off-road Vehicles	Yes
Trucks, Buses, Trailers	Yes
Specialty Vehicles	Yes

Manufacturing Process Expertise

Metal Manufacturing Processes	
Plastics Manufacturing Processes	
Mfg. Machinery and Equipment	
Robotics	
Other Manufacturing Processes	

Knowledge Specialty

Aero and Fluid Dynamics	
CAD, CAM, CIM	8
Finite Element Analysis	8
Fuels and Lubricants	2
Ergonomics and Industrial Design	3
Joining and Fastening	2
Materials: Ferrous Metals	6
Materials: Non-ferrous Metals	1
Materials: Plastics	1
Materials: Composites	1
Materials: Rubber	1
Materials: Glass	1
Materials: Electrical/Electronic	4
Finishes and Coatings	1
Noise and Vibration	7
Simulation and Modelling	8
Stress/Strain/Stiffness	8
Systems Integration	8
Other	

Automotive Component Specialty

Body and Structure	7
Electrical System	1
Engines	7
Emission Controls	
Heating, Ventilation and A/C	
Instruments and Controls	3
Interior Trim and Components	
Steering, Suspension, Brakes	
Transmission	7
Safety	3
Wheels and Tires	7
Diagnostic and Service Equipment	

Affiliations With Other Organizations

American Society of Agricultural Engineers. Canadian Society for Agricultural Engineering. Licensing Executives Society. SAE.

R&D Projects

Integration of coordinate measurement equipment. Finite element analysis of buses, AG components. CAE applications. Tractor design. Noise control.

Special R&D Facilities

Data base (technology) searches. Access to CAD, CAE, finite element analysis (i.e. standard computer-aided engineering and analysis tools). Access to technical expertise in electronics, hardware and software. Floor Space Devoted to R&D: 20 m^2.

Holland College Technology Centre

35 First Avenue
CHARLOTTETOWN, P.E.I.
C1E 1B0

Date of Response: March 21, 1990
Contact: M. Chapman
Title: Director
Phone: (902) 566-9380
Fax: (902) 566-7641

Organization Type

Government Laboratory	
Technology Centre	
Community College	Yes
University	
Industrial Company	
Other (including Consulting)	

Total Staffing

1-24 Employees	Yes
25-99 Employees	
100-499 Employees	
500-999 Employees	
1 000+ Employees	
Total Staff	22

R&D Staffing

Doctorate Level	
Master's Level	
Bachelor's Level	3
Technologists	6
Total R&D Staff	

Type of R&D Performed

Research	
Product Design	
Manufacturing Processes	
Industrial Engineering	Yes
Plant and Env. Hazards Eng.	
Test and Evaluation	Yes

Vehicle Applicability

Alternate and Multifuel	
Electric and Hybrid	
Cars and Vans	
Off-road Vehicles	
Trucks, Buses, Trailers	
Specialty Vehicles	

Manufacturing Process Expertise

Metal Manufacturing Processes	
Plastics Manufacturing Processes	
Mfg. Machinery and Equipment	
Robotics	
Other Manufacturing Processes	

Knowledge Specialty

Aero and Fluid Dynamics	5
CAD, CAM, CIM	5
Finite Element Analysis	
Fuels and Lubricants	
Ergonomics and Industrial Design	
Joining and Fastening	
Materials: Ferrous Metals	
Materials: Non-ferrous Metals	
Materials: Plastics	
Materials: Composites	
Materials: Rubber	
Materials: Glass	
Materials: Electrical/Electronic	5
Finishes and Coatings	
Noise and Vibration	
Simulation and Modelling	
Stress/Strain/Stiffness	
Systems Integration	
Other	

Automotive Component Specialty

Body and Structure	
Electrical System	5
Engines	
Emission Controls	
Heating, Ventilation and A/C	
Instruments and Controls	
Interior Trim and Components	
Steering, Suspension, Brakes	
Transmission	
Safety	
Wheels and Tires	
Diagnostic and Service Equipment	

Affiliations With Other Organizations

None Reported.

R&D Projects

Design and development in the fields of electronics, computers, electromechanical and automotive technology.

Special R&D Facilities

Electronics laboratory. Autocad facility. Hydraulics facility. Floor Space Devoted to R&D: Not Reported.

Hugh Macmillan Rehabilitation Centre
Rehabilitation Engineering

350 Rumsey Road
TORONTO, Ont.
M4G 1R8

Date of Response: April 4, 1990
Contact: Stephen Naumann
Title: Associate Director
Phone: (416) 425-6393
Fax: (416) 425-6591

Organization Type	
Government Laboratory	
Technology Centre	Yes
Community College	
University	
Industrial Company	
Other (including Consulting)	

Total Staffing	
1-24 Employees	
25-99 Employees	Yes
100-499 Employees	
500-999 Employees	
1 000+ Employees	
Total Staff	45

R&D Staffing	
Doctorate Level	2
Master's Level	2
Bachelor's Level	9
Technologists	
Total R&D Staff	21

Type of R&D Performed
- Research
- Product Design
- Manufacturing Processes
- Industrial Engineering
- Plant and Env. Hazards Eng.
- Test and Evaluation

Vehicle Applicability	
Alternate and Multifuel	
Electric and Hybrid	
Cars and Vans	
Off-road Vehicles	
Trucks, Buses, Trailers	
Specialty Vehicles	Yes

Manufacturing Process Expertise
- Metal Manufacturing Processes
- Plastics Manufacturing Processes
- Mfg. Machinery and Equipment
- Robotics
- Other Manufacturing Processes

Knowledge Specialty	
Aero and Fluid Dynamics	
CAD, CAM, CIM	
Finite Element Analysis	
Fuels and Lubricants	
Ergonomics and Industrial Design	
Joining and Fastening	
Materials: Ferrous Metals	
Materials: Non-ferrous Metals	
Materials: Plastics	
Materials: Composites	
Materials: Rubber	
Materials: Glass	
Materials: Electrical/Electronic	
Finishes and Coatings	
Noise and Vibration	
Simulation and Modelling	
Stress/Strain/Stiffness	
Systems Integration	
Other	10

Automotive Component Specialty
- Body and Structure
- Electrical System
- Engines
- Emission Controls
- Heating, Ventilation and A/C
- Instruments and Controls
- Interior Trim and Components
- Steering, Suspension, Brakes
- Transmission
- Safety
- Wheels and Tires
- Diagnostic and Service Equipment

Affiliations With Other Organizations
University of Toronto, Institute of Biomedical Engineering.

R&D Projects
Further development and clinical testing of a multi-function vehicular interface unit for quadriplegic drivers. Design and testing of a system that, through use of three switches, will allow severely physically disabled van drivers to access all secondary controls in a van.

Special R&D Facilities
Human movement laboratory — automated 3-D tracking. Floor Space Devoted to R&D: 657 m^2.

Hydro-Québec
Laboratoire des technologies électrochimiques/électrotechniques

600 de la Montagne
SHAWINIGAN, Que.
G9N 6T6

Date of Response: July 24, 1990
Contact: Dr. Antoine Théorêt
Title: Director
Phone: (819) 539-1450
Fax: (819) 539-1409

Organization Type	
Government Laboratory	
Technology Centre	Yes
Community College	
University	
Industrial Company	
Other (including Consulting)	

Total Staffing	
1-24 Employees	
25-99 Employees	Yes
100-499 Employees	
500-999 Employees	
1 000+ Employees	
Total Staff	75

R&D Staffing	
Doctorate Level	12
Master's Level	6
Bachelor's Level	14
Technologists	20
Total R&D Staff	52

Type of R&D Performed	
Research	Yes
Product Design	
Manufacturing Processes	Yes
Industrial Engineering	
Plant and Env. Hazards Eng.	
Test and Evaluation	

Vehicle Applicability	
Alternate and Multifuel	
Electric and Hybrid	Yes
Cars and Vans	
Off-road Vehicles	
Trucks, Buses, Trailers	
Specialty Vehicles	

Manufacturing Process Expertise	
Metal Manufacturing Processes	10
Plastics Manufacturing Processes	10
Mfg. Machinery and Equipment	10
Robotics	
Other Manufacturing Processes	

Knowledge Specialty	
Aero and Fluid Dynamics	
CAD, CAM, CIM	
Finite Element Analysis	
Fuels and Lubricants	
Ergonomics and Industrial Design	
Joining and Fastening	
Materials: Ferrous Metals	
Materials: Non-ferrous Metals	8
Materials: Plastics	8
Materials: Composites	8
Materials: Rubber	
Materials: Glass	
Materials: Electrical/Electronic	10
Finishes and Coatings	
Noise and Vibration	
Simulation and Modelling	
Stress/Strain/Stiffness	
Systems Integration	
Other	

Automotive Component Specialty	
Body and Structure	
Electrical System	8
Engines	
Emission Controls	
Heating, Ventilation and A/C	
Instruments and Controls	
Interior Trim and Components	
Steering, Suspension, Brakes	
Transmission	
Safety	
Wheels and Tires	
Diagnostic and Service Equipment	

Affiliations With Other Organizations
None Reported.

R&D Projects
Development of processes for manufacturing high-energy polymer-electrolyte batteries for use in electric vehicles.

Special R&D Facilities
Drying facility (3.45 MPa). Workshop for making lithium foil for solid electrolyte lithium batteries designed for electric vehicles.
Floor Space Devoted to R&D: Not Reported.

Hydro-Québec Research Institute

P.O. Box 1000
VARENNES, Que.
J3X 1S1

Date of Response: June 3, 1990
Contact: Guy Bélanger
Title: Group Manager
Phone: (514) 652-8231
Fax: (514) 652-8424

Organization Type	
Government Laboratory	
Technology Centre	
Community College	
University	
Industrial Company	Yes
Other (including Consulting)	

Total Staffing	
1-24 Employees	
25-99 Employees	
100-499 Employees	
500-999 Employees	
1 000+ Employees	Yes
Total Staff	19 400

R&D Staffing	
Doctorate Level	70
Master's Level	30
Bachelor's Level	50
Technologists	150
Total R&D Staff	600

Type of R&D Performed	
Research	Yes
Product Design	
Manufacturing Processes	
Industrial Engineering	
Plant and Env. Hazards Eng.	
Test and Evaluation	Yes

Vehicle Applicability	
Alternate and Multifuel	
Electric and Hybrid	Yes
Cars and Vans	
Off-road Vehicles	
Trucks, Buses, Trailers	
Specialty Vehicles	

Manufacturing Process Expertise	
Metal Manufacturing Processes	
Plastics Manufacturing Processes	
Mfg. Machinery and Equipment	
Robotics	
Other Manufacturing Processes	

Knowledge Specialty	
Aero and Fluid Dynamics	
CAD, CAM, CIM	
Finite Element Analysis	10
Fuels and Lubricants	10
Ergonomics and Industrial Design	
Joining and Fastening	
Materials: Ferrous Metals	
Materials: Non-ferrous Metals	10
Materials: Plastics	8
Materials: Composites	
Materials: Rubber	
Materials: Glass	
Materials: Electrical/Electronic	10
Finishes and Coatings	
Noise and Vibration	
Simulation and Modelling	
Stress/Strain/Stiffness	
Systems Integration	
Other	

Automotive Component Specialty	
Body and Structure	
Electrical System	8
Engines	
Emission Controls	
Heating, Ventilation and A/C	
Instruments and Controls	
Interior Trim and Components	
Steering, Suspension, Brakes	
Transmission	8
Safety	
Wheels and Tires	
Diagnostic and Service Equipment	

Affiliations With Other Organizations
None Reported.

R&D Projects
Battery development for electric vehicles. Motor for electric vehicle applications.

Special R&D Facilities
Material characterization facilities. High current testing facilities. Battery expertise and testing facilities. Electric vehicle motor testing bench. Floor Space Devoted to R&D: Not Reported.

IPL Inc.

140 Commerciale
SAINT-DAMIEN, Que.
G0R 2Y0

Date of Response: **June 29, 1990**
Contact: **Jean-Marie Chabot**
Title: **Vice President, Research and Development**
Phone: **(418) 789-2880**
Fax: **(418) 789-3382**

Organization Type

Government Laboratory	
Technology Centre	
Community College	
University	
Industrial Company	Yes
Other (including Consulting)	

Total Staffing

1-24 Employees	
25-99 Employees	
100-499 Employees	
500-999 Employees	Yes
1 000+ Employees	
Total Staff	525

R&D Staffing

Doctorate Level	
Master's Level	1
Bachelor's Level	12
Technologists	5
Total R&D Staff	20

Type of R&D Performed

Research	Yes
Product Design	Yes
Manufacturing Processes	Yes
Industrial Engineering	Yes
Plant and Env. Hazards Eng.	
Test and Evaluation	Yes

Vehicle Applicability

Alternate and Multifuel	
Electric and Hybrid	
Cars and Vans	Yes
Off-road Vehicles	
Trucks, Buses, Trailers	Yes
Specialty Vehicles	

Manufacturing Process Expertise

Metal Manufacturing Processes	
Plastics Manufacturing Processes	10
Mfg. Machinery and Equipment	
Robotics	2
Other Manufacturing Processes	1

Knowledge Specialty

Aero and Fluid Dynamics	
CAD, CAM, CIM	10
Finite Element Analysis	10
Fuels and Lubricants	
Ergonomics and Industrial Design	1
Joining and Fastening	
Materials: Ferrous Metals	
Materials: Non-ferrous Metals	
Materials: Plastics	10
Materials: Composites	3
Materials: Rubber	1
Materials: Glass	
Materials: Electrical/Electronic	
Finishes and Coatings	1
Noise and Vibration	
Simulation and Modelling	8
Stress/Strain/Stiffness	
Systems Integration	
Other	

Automotive Component Specialty

Body and Structure	10
Electrical System	2
Engines	
Emission Controls	
Heating, Ventilation and A/C	3
Instruments and Controls	
Interior Trim and Components	10
Steering, Suspension, Brakes	
Transmission	
Safety	
Wheels and Tires	
Diagnostic and Service Equipment	

Affiliations With Other Organizations

Development agreement with Ford, Mazda, Nissan, Bombardier (Ski Doo). IMRI (CNFC). Laval University. CQIP. CRIQ.

R&D Projects

Software development for injection-moulded parts. New materials and additives for thermoplastics. Mould flow analysis.

Special R&D Facilities

CAD/CAM systems. Finite element analysis. Robotics. Floor Space Devoted to R&D: 800 m^2.

Ingenious Devices Ltd.

P.O. Box 505
ORILLIA, Ont.
L3V 6K2

Date of Response: March 28, 1990
Contact: Kris Parnham
Title: Sales Manager
Phone: (705) 325-2689
Fax: (705) 325-1217

Organization Type

Government Laboratory	
Technology Centre	
Community College	
University	
Industrial Company	Yes
Other (including Consulting)	

Total Staffing

1-24 Employees	
25-99 Employees	Yes
100-499 Employees	
500-999 Employees	
1 000+ Employees	
Total Staff	33

R&D Staffing

Doctorate Level	
Master's Level	
Bachelor's Level	
Technologists	
Total R&D Staff	4

Type of R&D Performed

Research	
Product Design	Yes
Manufacturing Processes	Yes
Industrial Engineering	
Plant and Env. Hazards Eng.	
Test and Evaluation	

Vehicle Applicability

Alternate and Multifuel	
Electric and Hybrid	
Cars and Vans	Yes
Off-road Vehicles	
Trucks, Buses, Trailers	
Specialty Vehicles	

Manufacturing Process Expertise

Metal Manufacturing Processes	
Plastics Manufacturing Processes	
Mfg. Machinery and Equipment	10
Robotics	5
Other Manufacturing Processes	

Knowledge Specialty

Aero and Fluid Dynamics
CAD, CAM, CIM
Finite Element Analysis
Fuels and Lubricants
Ergonomics and Industrial Design
Joining and Fastening
Materials: Ferrous Metals
Materials: Non-ferrous Metals
Materials: Plastics
Materials: Composites
Materials: Rubber
Materials: Glass
Materials: Electrical/Electronic
Finishes and Coatings
Noise and Vibration
Simulation and Modelling
Stress/Strain/Stiffness
Systems Integration
Other

Automotive Component Specialty

Body and Structure	
Electrical System	
Engines	10
Emission Controls	
Heating, Ventilation and A/C	
Instruments and Controls	
Interior Trim and Components	
Steering, Suspension, Brakes	
Transmission	
Safety	
Wheels and Tires	
Diagnostic and Service Equipment	

Affiliations With Other Organizations

None Reported.

R&D Projects

Robotic machine for valve guide reaming and three-angle valve seat cutting.

Special R&D Facilities

Floor Space Devoted to R&D: 371 m^2.

Ingersoll-Rand Canada Inc.

Torrington Division

4 Victoria Street
BEDFORD, Que.
J0J 1A0

Date of Response: June 7, 1990
Contact: **Claude St-Hilaire**
Title: **Plant Manager**
Phone: **(514) 248-3316**
Fax: **(514) 248-4196**

Organization Type	
Government Laboratory	
Technology Centre	
Community College	
University	
Industrial Company	Yes
Other (including Consulting)	

Total Staffing	
1-24 Employees	
25-99 Employees	
100-499 Employees	Yes
500-999 Employees	
1 000+ Employees	
Total Staff	140

R&D Staffing	
Doctorate Level	
Master's Level	
Bachelor's Level	6
Technologists	
Total R&D Staff	6

Type of R&D Performed	
Research	
Product Design	
Manufacturing Processes	Yes
Industrial Engineering	
Plant and Env. Hazards Eng.	
Test and Evaluation	

Vehicle Applicability	
Alternate and Multifuel	
Electric and Hybrid	
Cars and Vans	Yes
Off-road Vehicles	
Trucks, Buses, Trailers	
Specialty Vehicles	

Manufacturing Process Expertise	
Metal Manufacturing Processes	6
Plastics Manufacturing Processes	
Mfg. Machinery and Equipment	7
Robotics	5
Other Manufacturing Processes	

Knowledge Specialty			
Aero and Fluid Dynamics		Finishes and Coatings	10
CAD, CAM, CIM	6	Noise and Vibration	
Finite Element Analysis		Simulation and Modelling	9
Fuels and Lubricants		Stress/Strain/Stiffness	
Ergonomics and Industrial Design	4	Systems Integration	
Joining and Fastening		Other	
Materials: Ferrous Metals	5		
Materials: Non-ferrous Metals			
Materials: Plastics			
Materials: Composites			
Materials: Rubber			
Materials: Glass			
Materials: Electrical/Electronic			

Automotive Component Specialty	
Body and Structure	
Electrical System	
Engines	
Emission Controls	
Heating, Ventilation and A/C	
Instruments and Controls	
Interior Trim and Components	
Steering, Suspension, Brakes	
Transmission	10
Safety	
Wheels and Tires	
Diagnostic and Service Equipment	

Affiliations With Other Organizations

Parent is Torrington Co. of Torrington, Connecticut. Manufacturing Development Center, Norcross, Georgia. Advanced Technology Center, Torrington, Connecticut.

R&D Projects

Machining, grinding, cold forming, stamping, broaching. Robotics. Inspection vision system.

Special R&D Facilities

R&D is limited to process development and improvement. It can be realized in cooperation with the parent's research centres or in house. Floor Space Devoted to R&D: 8 m^2.

Institut d'ordinique du Québec

150 Duquet
SAINTE-THÉRÈSE, Que.
J7E 5B3

Date of Response: **May 4, 1990**
Contact: **Gilles Pilon**
Title: **Director**
Phone: **(514) 437-8088**
Fax: **(514) 437-1102**

Organization Type

Government Laboratory	
Technology Centre	Yes
Community College	
University	
Industrial Company	
Other (including Consulting)	

Total Staffing

1-24 Employees	
25-99 Employees	Yes
100-499 Employees	
500-999 Employees	
1 000+ Employees	
Total Staff	

R&D Staffing

Doctorate Level	1
Master's Level	
Bachelor's Level	25
Technologists	6
Total R&D Staff	15

Type of R&D Performed

Research	
Product Design	Yes
Manufacturing Processes	Yes
Industrial Engineering	
Plant and Env. Hazards Eng.	
Test and Evaluation	

Vehicle Applicability

- Alternate and Multifuel
- Electric and Hybrid
- Cars and Vans
- Off-road Vehicles
- Trucks, Buses, Trailers
- Specialty Vehicles

Manufacturing Process Expertise

Metal Manufacturing Processes	
Plastics Manufacturing Processes	
Mfg. Machinery and Equipment	
Robotics	6
Other Manufacturing Processes	

Knowledge Specialty

Aero and Fluid Dynamics	
CAD, CAM, CIM	8
Finite Element Analysis	
Fuels and Lubricants	
Ergonomics and Industrial Design	
Joining and Fastening	
Materials: Ferrous Metals	
Materials: Non-ferrous Metals	
Materials: Plastics	
Materials: Composites	
Materials: Rubber	
Materials: Glass	
Materials: Electrical/Electronic	8
Finishes and Coatings	
Noise and Vibration	
Simulation and Modelling	
Stress/Strain/Stiffness	
Systems Integration	
Other	

Automotive Component Specialty

Body and Structure	
Electrical System	8
Engines	
Emission Controls	
Heating, Ventilation and A/C	
Instruments and Controls	
Interior Trim and Components	
Steering, Suspension, Brakes	
Transmission	
Safety	
Wheels and Tires	
Diagnostic and Service Equipment	

Affiliations With Other Organizations

None Reported.

R&D Projects

Process control by computer. Microprocessor control.

Special R&D Facilities

CAD facilities: ICAM, 20 Autocad stations. Robotics facilities: ASEA RB-20. Two VAX 780 computers. Two Novell networks. Numerical machines: one lathe (Mazaq), arc/MC, one milling machine (Mazaq VCO 15/40). Floor Space Devoted to R&D: 1 200 m^2.

KTC Testing and Development Inc.

P.O. Box 59
Lowther Base
OPASATIKA, Ont.
P0L 1Z0

Date of Response: **April 30, 1990**
Contact: **M.G. (Gerry) Malloy, P.Eng.**
Title: **President and Principal Engineer**
Phone: **(705) 369-2041**
Fax: **(705) 369-2051**

Organization Type	
Government Laboratory	
Technology Centre	
Community College	
University	
Industrial Company	
Other (including Consulting)	Yes

Total Staffing	
1-24 Employees	Yes
25-99 Employees	
100-499 Employees	
500-999 Employees	
1 000+ Employees	
Total Staff	

R&D Staffing	
Doctorate Level	
Master's Level	1
Bachelor's Level	2
Technologists	2
Total R&D Staff	

Type of R&D Performed	
Research	Yes
Product Design	Yes
Manufacturing Processes	
Industrial Engineering	
Plant and Env. Hazards Eng.	
Test and Evaluation	Yes

Vehicle Applicability	
Alternate and Multifuel	Yes
Electric and Hybrid	Yes
Cars and Vans	Yes
Off-road Vehicles	Yes
Trucks, Buses, Trailers	Yes
Specialty Vehicles	Yes

Manufacturing Process Expertise	
Metal Manufacturing Processes	
Plastics Manufacturing Processes	5
Mfg. Machinery and Equipment	3
Robotics	
Other Manufacturing Processes	

Knowledge Specialty	
Aero and Fluid Dynamics	7
CAD, CAM, CIM	2
Finite Element Analysis	
Fuels and Lubricants	9
Ergonomics and Industrial Design	10
Joining and Fastening	6
Materials: Ferrous Metals	5
Materials: Non-ferrous Metals	5
Materials: Plastics	8
Materials: Composites	6
Materials: Rubber	2
Materials: Glass	
Materials: Electrical/Electronic	2
Finishes and Coatings	7
Noise and Vibration	6
Simulation and Modelling	4
Stress/Strain/Stiffness	3
Systems Integration	
Other	10

Automotive Component Specialty	
Body and Structure	7
Electrical System	5
Engines	9
Emission Controls	8
Heating, Ventilation and A/C	10
Instruments and Controls	8
Interior Trim and Components	6
Steering, Suspension, Brakes	9
Transmission	8
Safety	9
Wheels and Tires	9
Diagnostic and Service Equipment	7

Affiliations With Other Organizations

South Florida Test Services and Phoenix, Arizona, for cooperative exposure testing at climatic extremes and for vehicle testing in hot climate conditions.

R&D Projects

Automotive reliability/durability test and development; cold start and drivability studies including fuel and alternate fuel effects; heating and defrosting studies including human comfort correlation; ABS performance on uniform or erratic snow/ice surfaces; traction control system evaluations; tire traction tests; driver performance evaluation and training in winter conditions; fuel/lubricant performance and effects in low temperature operating conditions.

Special R&D Facilities

"Real World" cold weather test facility including indoor/outdoor vehicle soak areas, private or common garage, office space for clients, garage/office/instrument lab for contractual testing and development services, 2 km on-site road system; instrumentation for stationary and mobile vehicle testing including 80-channel data acquisition system and related software; off-site snow packed and ice-surfaced runways for tire testing including traction, braking, traction control systems, ABS. Floor Space Devoted to R&D: Not Reported.

KVB Manufacturing

62 Maple Avenue North
SMITHS FALLS, Ont.
K7A 2A7

Date of Response: April 5, 1990
Contact: Clifford L. Wolfe
Title: President
Phone: (613) 283-3196

Organization Type

Government Laboratory	
Technology Centre	
Community College	
University	
Industrial Company	Yes
Other (including Consulting)	

Total Staffing

1-24 Employees	Yes
25-99 Employees	
100-499 Employees	
500-999 Employees	
1 000+ Employees	
Total Staff	5

R&D Staffing

Doctorate Level	
Master's Level	
Bachelor's Level	
Technologists	
Total R&D Staff	3

Type of R&D Performed

Research	
Product Design	Yes
Manufacturing Processes	Yes
Industrial Engineering	Yes
Plant and Env. Hazards Eng.	
Test and Evaluation	

Vehicle Applicability

Alternate and Multifuel	
Electric and Hybrid	
Cars and Vans	
Off-road Vehicles	
Trucks, Buses, Trailers	
Specialty Vehicles	Yes

Manufacturing Process Expertise

Metal Manufacturing Processes	
Plastics Manufacturing Processes	
Mfg. Machinery and Equipment	
Robotics	
Other Manufacturing Processes	5

Knowledge Specialty

Aero and Fluid Dynamics	
CAD, CAM, CIM	
Finite Element Analysis	
Fuels and Lubricants	
Ergonomics and Industrial Design	5
Joining and Fastening	
Materials: Ferrous Metals	
Materials: Non-ferrous Metals	
Materials: Plastics	
Materials: Composites	
Materials: Rubber	
Materials: Glass	
Materials: Electrical/Electronic	
Finishes and Coatings	
Noise and Vibration	
Simulation and Modelling	
Stress/Strain/Stiffness	
Systems Integration	
Other	

Automotive Component Specialty

Body and Structure	5
Electrical System	5
Engines	
Emission Controls	
Heating, Ventilation and A/C	
Instruments and Controls	5
Interior Trim and Components	
Steering, Suspension, Brakes	5
Transmission	
Safety	5
Wheels and Tires	
Diagnostic and Service Equipment	

Affiliations With Other Organizations

None Reported.

R&D Projects

The Elaine Anne Lift (wheelchair lift and transfer system) for Chevrolet Blazer. Modification of Chevrolet Blazer. Manufacture and installation of lift and transfer system.

Special R&D Facilities

Floor Space Devoted to R&D: 120 m^2.

Lakehead University
Department of Mechanical Engineering

955 Oliver Road
THUNDER BAY, Ont.
P7B 5E1

Date of Response: June 5, 1990
Contact: Dr. Seimer H.L. Tsang
Title: Professor and Chairman
Phone: (807) 343-8761
Fax: (807) 343-8023

Organization Type

Government Laboratory	
Technology Centre	
Community College	
University	Yes
Industrial Company	
Other (including Consulting)	

Total Staffing

1-24 Employees	
25-99 Employees	
100-499 Employees	
500-999 Employees	Yes
1 000+ Employees	
Total Staff	641

R&D Staffing

Doctorate Level	28
Master's Level	
Bachelor's Level	
Technologists	8
Total R&D Staff	36

Type of R&D Performed

Research	Yes
Product Design	Yes
Manufacturing Processes	Yes
Industrial Engineering	
Plant and Env. Hazards Eng.	
Test and Evaluation	Yes

Vehicle Applicability

Alternate and Multifuel	Yes
Electric and Hybrid	Yes
Cars and Vans	Yes
Off-road Vehicles	Yes
Trucks, Buses, Trailers	Yes
Specialty Vehicles	Yes

Manufacturing Process Expertise

Metal Manufacturing Processes	
Plastics Manufacturing Processes	
Mfg. Machinery and Equipment	
Robotics	
Other Manufacturing Processes	

Knowledge Specialty

Aero and Fluid Dynamics	6
CAD, CAM, CIM	6
Finite Element Analysis	8
Fuels and Lubricants	
Ergonomics and Industrial Design	
Joining and Fastening	5
Materials: Ferrous Metals	5
Materials: Non-ferrous Metals	5
Materials: Plastics	5
Materials: Composites	5
Materials: Rubber	5
Materials: Glass	5
Materials: Electrical/Electronic	6
Finishes and Coatings	
Noise and Vibration	10
Simulation and Modelling	10
Stress/Strain/Stiffness	10
Systems Integration	5
Other	

Automotive Component Specialty

Body and Structure	6
Electrical System	7
Engines	7
Emission Controls	7
Heating, Ventilation and A/C	
Instruments and Controls	9
Interior Trim and Components	
Steering, Suspension, Brakes	5
Transmission	5
Safety	5
Wheels and Tires	
Diagnostic and Service Equipment	

Affiliations With Other Organizations
None Reported.

R&D Projects
None Reported.

Special R&D Facilities
Sun 3 workstations. ANSYS finite element analysis software. Various labs and equipment. Floor Space Devoted to R&D: 50 m^2.

Long Manufacturing Ltd.

700 Kerr Street
OAKVILLE, Ont.
L6K 3W5

Date of Response: June 11, 1990
Contact: Mr. T. Zielinski
Title: Technical Director
Phone: (416) 845-4291
Fax: (416) 845-0685

Organization Type

Government Laboratory	
Technology Centre	
Community College	
University	
Industrial Company	Yes
Other (including Consulting)	

Total Staffing

1-24 Employees	
25-99 Employees	
100-499 Employees	Yes
500-999 Employees	
1 000+ Employees	
Total Staff	

R&D Staffing

Doctorate Level	
Master's Level	4
Bachelor's Level	4
Technologists	11
Total R&D Staff	22

Type of R&D Performed

Research	
Product Design	Yes
Manufacturing Processes	Yes
Industrial Engineering	
Plant and Env. Hazards Eng.	
Test and Evaluation	Yes

Vehicle Applicability

Alternate and Multifuel	
Electric and Hybrid	
Cars and Vans	Yes
Off-road Vehicles	Yes
Trucks, Buses, Trailers	Yes
Specialty Vehicles	Yes

Manufacturing Process Expertise

Metal Manufacturing Processes	9
Plastics Manufacturing Processes	1
Mfg. Machinery and Equipment	8
Robotics	2
Other Manufacturing Processes	

Knowledge Specialty

Aero and Fluid Dynamics	10
CAD, CAM, CIM	5
Finite Element Analysis	4
Fuels and Lubricants	3
Ergonomics and Industrial Design	3
Joining and Fastening	10
Materials: Ferrous Metals	6
Materials: Non-ferrous Metals	9
Materials: Plastics	3
Materials: Composites	4
Materials: Rubber	1
Materials: Glass	1
Materials: Electrical/Electronic	5
Finishes and Coatings	8
Noise and Vibration	7
Simulation and Modelling	7
Stress/Strain/Stiffness	5
Systems Integration	5
Other	

Automotive Component Specialty

Body and Structure	4
Electrical System	
Engines	7
Emission Controls	
Heating, Ventilation and A/C	10
Instruments and Controls	2
Interior Trim and Components	
Steering, Suspension, Brakes	2
Transmission	9
Safety	
Wheels and Tires	
Diagnostic and Service Equipment	

Affiliations With Other Organizations

SAE, ASTM, ASHRAE, SME, AWS, ASM, ASME.

R&D Projects

Heat transfer/heat dissipating components for engines, transmissions, and air conditioning for automobiles. Corrosion protection for automobile and truck cooling systems. Process development in brazing processes. Proprietary plating process development.

Special R&D Facilities

Wind tunnels-radiators, oil-to-air coolers, air conditioning, heat transfer calorimeters, metallurgical lab, corrosion testing, prototype machine shop, pressure cycling test equipment, vibration test equipment, prototype inert gas and vacuum brazing furnaces, lab plating cells. Floor Space Devoted to R&D: 300 m^2.

METCOR Inc.

10600 Secant
ANJOU, Que.
H1J 1S5

Date of Response: **July 27, 1990**
Contact: **Réal Lafrenière**
Title: **Vice President**
Phone: **(514) 353-1500**

Organization Type	
Government Laboratory	
Technology Centre	
Community College	
University	
Industrial Company	Yes
Other (including Consulting)	

Total Staffing	
1-24 Employees	
25-99 Employees	Yes
100-499 Employees	
500-999 Employees	
1 000+ Employees	
Total Staff	

R&D Staffing	
Doctorate Level	
Master's Level	
Bachelor's Level	2
Technologists	
Total R&D Staff	3

Type of R&D Performed	
Research	
Product Design	
Manufacturing Processes	Yes
Industrial Engineering	
Plant and Env. Hazards Eng.	
Test and Evaluation	Yes

Vehicle Applicability	
Alternate and Multifuel	
Electric and Hybrid	
Cars and Vans	Yes
Off-road Vehicles	Yes
Trucks, Buses, Trailers	
Specialty Vehicles	

Manufacturing Process Expertise	
Metal Manufacturing Processes	8
Plastics Manufacturing Processes	
Mfg. Machinery and Equipment	
Robotics	
Other Manufacturing Processes	

Knowledge Specialty	
Aero and Fluid Dynamics	
CAD, CAM, CIM	
Finite Element Analysis	
Fuels and Lubricants	
Ergonomics and Industrial Design	
Joining and Fastening	
Materials: Ferrous Metals	8
Materials: Non-ferrous Metals	2
Materials: Plastics	
Materials: Composites	
Materials: Rubber	
Materials: Glass	
Materials: Electrical/Electronic	
Finishes and Coatings	5
Noise and Vibration	
Simulation and Modelling	
Stress/Strain/Stiffness	8
Systems Integration	
Other	

Automotive Component Specialty	
Body and Structure	
Electrical System	
Engines	2
Emission Controls	
Heating, Ventilation and A/C	
Instruments and Controls	
Interior Trim and Components	
Steering, Suspension, Brakes	3
Transmission	9
Safety	
Wheels and Tires	
Diagnostic and Service Equipment	

Affiliations With Other Organizations

None Reported.

R&D Projects

Applied R&D on specific power train parts.

Special R&D Facilities

Lab and production equipment. Floor Space Devoted to R&D: Not Reported.

MacLennan Associates

1102-185 Clearview Avenue
OTTAWA, Ont.
K1Z 6R9

Date of Response: June 5, 1990
Contact: Barry MacLennan, P.Eng.
Title: Proprietor
Phone: (613) 761-9188
Fax: (613) 761-9193

Organization Type

Government Laboratory	
Technology Centre	
Community College	
University	
Industrial Company	
Other (including Consulting)	Yes

Total Staffing

1-24 Employees	Yes
25-99 Employees	
100-499 Employees	
500-999 Employees	
1 000+ Employees	
Total Staff	1

R&D Staffing

Doctorate Level	
Master's Level	
Bachelor's Level	1
Technologists	
Total R&D Staff	1

Type of R&D Performed

Research	
Product Design	Yes
Manufacturing Processes	
Industrial Engineering	
Plant and Env. Hazards Eng.	
Test and Evaluation	

Vehicle Applicability

Alternate and Multifuel	Yes
Electric and Hybrid	Yes
Cars and Vans	Yes
Off-road Vehicles	Yes
Trucks, Buses, Trailers	Yes
Specialty Vehicles	Yes

Manufacturing Process Expertise

Metal Manufacturing Processes	5
Plastics Manufacturing Processes	3
Mfg. Machinery and Equipment	2
Robotics	1
Other Manufacturing Processes	

Knowledge Specialty

Aero and Fluid Dynamics	6
CAD, CAM, CIM	4
Finite Element Analysis	4
Fuels and Lubricants	2
Ergonomics and Industrial Design	8
Joining and Fastening	5
Materials: Ferrous Metals	8
Materials: Non-ferrous Metals	8
Materials: Plastics	6
Materials: Composites	4
Materials: Rubber	2
Materials: Glass	3
Materials: Electrical/Electronic	4
Finishes and Coatings	6
Noise and Vibration	8
Simulation and Modelling	2
Stress/Strain/Stiffness	8
Systems Integration	5
Other	10

Automotive Component Specialty

Body and Structure	3
Electrical System	2
Engines	5
Emission Controls	3
Heating, Ventilation and A/C	1
Instruments and Controls	5
Interior Trim and Components	3
Steering, Suspension, Brakes	4
Transmission	2
Safety	4
Wheels and Tires	2
Diagnostic and Service Equipment	

Affiliations With Other Organizations

Annectron Engineering Inc.

R&D Projects

This directory, under contract to Industry, Science and Technology Canada, including the source data base and artwork for the final publication.

Special R&D Facilities

Floor Space Devoted to R&D: 10 m^2.

Magna International

36 Apple Creek Boulevard
MARKHAM, Ont.
L3R 4Y4

Date of Response: July 27, 1990
Contact: Mike Nishimura
Title: Director of Business Planning
Phone: (416) 477-7766
Fax: (416) 477-6350

Organization Type	
Government Laboratory	
Technology Centre	
Community College	
University	
Industrial Company	Yes
Other (including Consulting)	

Total Staffing	
1-24 Employees	
25-99 Employees	
100-499 Employees	
500-999 Employees	
1 000+ Employees	Yes
Total Staff	17 000

R&D Staffing	
Doctorate Level	
Master's Level	
Bachelor's Level	
Technologists	
Total R&D Staff	

Type of R&D Performed	
Research	
Product Design	Yes
Manufacturing Processes	Yes
Industrial Engineering	
Plant and Env. Hazards Eng.	
Test and Evaluation	Yes

Vehicle Applicability	
Alternate and Multifuel	Yes
Electric and Hybrid	Yes
Cars and Vans	Yes
Off-road Vehicles	
Trucks, Buses, Trailers	
Specialty Vehicles	

Manufacturing Process Expertise	
Metal Manufacturing Processes	10
Plastics Manufacturing Processes	10
Mfg. Machinery and Equipment	8
Robotics	6
Other Manufacturing Processes	

Knowledge Specialty	
Aero and Fluid Dynamics	
CAD, CAM, CIM	8
Finite Element Analysis	10
Fuels and Lubricants	
Ergonomics and Industrial Design	
Joining and Fastening	
Materials: Ferrous Metals	8
Materials: Non-ferrous Metals	8
Materials: Plastics	5
Materials: Composites	5
Materials: Rubber	
Materials: Glass	
Materials: Electrical/Electronic	
Finishes and Coatings	8
Noise and Vibration	8
Simulation and Modelling	
Stress/Strain/Stiffness	5
Systems Integration	
Other	

Automotive Component Specialty	
Body and Structure	10
Electrical System	8
Engines	4
Emission Controls	
Heating, Ventilation and A/C	
Instruments and Controls	
Interior Trim and Components	10
Steering, Suspension, Brakes	
Transmission	6
Safety	
Wheels and Tires	
Diagnostic and Service Equipment	

Affiliations With Other Organizations

None Reported.

R&D Projects

Product design engineering. Manufacturing process engineering. Testing and evaluation.

Special R&D Facilities

Floor Space Devoted to R&D: Not Reported.

Management of Technology and Innovation Institute

1276 Sandhill Drive
P.O. Box 7070
ANCASTER, Ont.
L9G 3L3

Date of Response: March 22, 1990
Contact: Walter F. Petryschuk
Title: Executive Director
Phone: (416) 648-7344
Fax: (416) 648-7311

Organization Type

Government Laboratory	
Technology Centre	Yes
Community College	
University	
Industrial Company	
Other (including Consulting)	

Total Staffing

1-24 Employees	
25-99 Employees	Yes
100-499 Employees	
500-999 Employees	
1 000+ Employees	
Total Staff	55

R&D Staffing

Doctorate Level	20
Master's Level	
Bachelor's Level	
Technologists	
Total R&D Staff	20

Type of R&D Performed

Research
Product Design
Manufacturing Processes
Industrial Engineering
Plant and Env. Hazards Eng.
Test and Evaluation

Vehicle Applicability

Alternate and Multifuel
Electric and Hybrid
Cars and Vans
Off-road Vehicles
Trucks, Buses, Trailers
Specialty Vehicles

Manufacturing Process Expertise

Metal Manufacturing Processes
Plastics Manufacturing Processes
Mfg. Machinery and Equipment
Robotics
Other Manufacturing Processes

Knowledge Specialty

Aero and Fluid Dynamics
CAD, CAM, CIM
Finite Element Analysis
Fuels and Lubricants
Ergonomics and Industrial Design
Joining and Fastening
Materials: Ferrous Metals
Materials: Non-ferrous Metals
Materials: Plastics
Materials: Composites
Materials: Rubber
Materials: Glass
Materials: Electrical/Electronic
Finishes and Coatings
Noise and Vibration
Simulation and Modelling
Stress/Strain/Stiffness
Systems Integration
Other

Automotive Component Specialty

Body and Structure
Electrical System
Engines
Emission Controls
Heating, Ventilation and A/C
Instruments and Controls
Interior Trim and Components
Steering, Suspension, Brakes
Transmission
Safety
Wheels and Tires
Diagnostic and Service Equipment

Affiliations With Other Organizations

McMaster University/Seminex; CIIT (NRC), Winnipeg; Simon Fraser University; École Polytechnique de Montréal; Sir Sanford Fleming College, Peterborough; Wilfrid Laurier, REMAT; TUNS, Halifax; University of Western Ontario, NCMRD, London.

R&D Projects

Intellectual property for the field of management of technology is developed specifically for commercial offerings across Canada and within firms. Topics include issues relating to policy, manufacturing, information technology, people. Also addressed are the process issues related to supporting technology as a competitive edge.

Special R&D Facilities

Institute conducts R&D in association with partners via a consortium as well as specific projects with individual principal investigations. Note: staff levels include associates. Floor Space Devoted to R&D: Not Reported.

Manufacturing Research Corporation of Ontario

Suite 201
1075 North Service Road West
OAKVILLE, Ont.
L6M 2G2

Date of Response: July 12, 1990
Contact: **Edward A. Dyson**
Title: **President**
Phone: **(416) 847-0170**
Fax: **(416) 847-2773**

Organization Type	
Government Laboratory	
Technology Centre	
Community College	
University	
Industrial Company	
Other (including Consulting)	Yes

Total Staffing	
1-24 Employees	Yes
25-99 Employees	
100-499 Employees	
500-999 Employees	
1 000+ Employees	
Total Staff	15

R&D Staffing	
Doctorate Level	1
Master's Level	2
Bachelor's Level	6
Technologists	
Total R&D Staff	

Type of R&D Performed	
Research	Yes
Product Design	Yes
Manufacturing Processes	Yes
Industrial Engineering	Yes
Plant and Env. Hazards Eng.	Yes
Test and Evaluation	Yes

Vehicle Applicability	
Alternate and Multifuel	
Electric and Hybrid	
Cars and Vans	
Off-road Vehicles	
Trucks, Buses, Trailers	
Specialty Vehicles	

Manufacturing Process Expertise	
Metal Manufacturing Processes	10
Plastics Manufacturing Processes	10
Mfg. Machinery and Equipment	10
Robotics	10
Other Manufacturing Processes	10

Knowledge Specialty			
Aero and Fluid Dynamics	10	Finishes and Coatings	
CAD, CAM, CIM	10	Noise and Vibration	10
Finite Element Analysis	10	Simulation and Modelling	10
Fuels and Lubricants	10	Stress/Strain/Stiffness	10
Ergonomics and Industrial Design	10	Systems Integration	10
Joining and Fastening	10	Other	
Materials: Ferrous Metals	10		
Materials: Non-ferrous Metals	10		
Materials: Plastics	10		
Materials: Composites	10		
Materials: Rubber			
Materials: Glass			
Materials: Electrical/Electronic	10		

Automotive Component Specialty	
Body and Structure	
Electrical System	
Engines	
Emission Controls	
Heating, Ventilation and A/C	
Instruments and Controls	
Interior Trim and Components	
Steering, Suspension, Brakes	
Transmission	
Safety	
Wheels and Tires	
Diagnostic and Service Equipment	

Affiliations With Other Organizations

Province of Ontario Centre of Excellence. All Ontario universities and other academic institutions. Many manufacturers. Canadian manufacturing associations.

R&D Projects

Many projects involving manufacturing, automation, product design, facilities design, processing, and manufacturing management and systems. Many industrial manufacturing consortia.

Special R&D Facilities

Major capability in developing, implementing and managing projects sponsored by industry and government with universities, federal and provincial research and technical institutions, and private research and technical companies. Floor Space Devoted to R&D: Not Reported.

McGill University
CSIRA Steel Processing Laboratory

3450 University Street
MONTREAL, Que.
H3A 2A7

Date of Response:	**July 16, 1990**
Contact:	**John J. Jonas**
Title:	**Professor**
Phone:	**(514) 398-4360**
Fax:	**(514) 398-4492**

Organization Type

Government Laboratory	
Technology Centre	
Community College	
University	Yes
Industrial Company	
Other (including Consulting)	

Total Staffing

1-24 Employees	
25-99 Employees	Yes
100-499 Employees	
500-999 Employees	
1 000+ Employees	Yes
Total Staff	

R&D Staffing

Doctorate Level	10
Master's Level	10
Bachelor's Level	
Technologists	5
Total R&D Staff	25

Type of R&D Performed

Research	Yes
Product Design	
Manufacturing Processes	Yes
Industrial Engineering	
Plant and Env. Hazards Eng.	
Test and Evaluation	

Vehicle Applicability

Alternate and Multifuel	Yes
Electric and Hybrid	Yes
Cars and Vans	Yes
Off-road Vehicles	Yes
Trucks, Buses, Trailers	Yes
Specialty Vehicles	Yes

Manufacturing Process Expertise

Metal Manufacturing Processes	10
Plastics Manufacturing Processes	
Mfg. Machinery and Equipment	
Robotics	
Other Manufacturing Processes	

Knowledge Specialty

Aero and Fluid Dynamics	
CAD, CAM, CIM	
Finite Element Analysis	
Fuels and Lubricants	
Ergonomics and Industrial Design	
Joining and Fastening	
Materials: Ferrous Metals	10
Materials: Non-ferrous Metals	10
Materials: Plastics	
Materials: Composites	
Materials: Rubber	
Materials: Glass	
Materials: Electrical/Electronic	
Finishes and Coatings	
Noise and Vibration	
Simulation and Modelling	10
Stress/Strain/Stiffness	
Systems Integration	
Other	

Automotive Component Specialty

- Body and Structure
- Electrical System
- Engines
- Emission Controls
- Heating, Ventilation and A/C
- Instruments and Controls
- Interior Trim and Components
- Steering, Suspension, Brakes
- Transmission
- Safety
- Wheels and Tires
- Diagnostic and Service Equipment

Affiliations With Other Organizations

Canadian Steel Industry Research Association (CSIRA).

R&D Projects

Development of controlled rolling practices for major Canadian steel companies. Development of on-line R-value sensors. Development of processing methods for improving the formability of sheet steels.

Special R&D Facilities

Computerized tension, compression and torsion machines. High temperature furnaces (vacuum and controlled atmosphere). R-value measurement equipment. Texture measurement equipment. Computers and codes for simulation of sheet metal forming. Floor Space Devoted to R&D: 100 m^2.

McGill University
Department of Mining and Metallurgical Engineering

3450 University Street
MONTREAL, Que.
H3A 2A7

Date of Response: April 27, 1990
Contact: Professor R.A.L. Drew
Title: Director, Ceramics Research Program
Phone: (514) 398-4361
Fax: (514) 398-4492

Organization Type

Government Laboratory	
Technology Centre	
Community College	
University	Yes
Industrial Company	
Other (including Consulting)	

Total Staffing

1-24 Employees	Yes
25-99 Employees	
100-499 Employees	
500-999 Employees	
1 000+ Employees	
Total Staff	11

R&D Staffing

Doctorate Level	4
Master's Level	7
Bachelor's Level	
Technologists	
Total R&D Staff	11

Type of R&D Performed

Research	Yes
Product Design	
Manufacturing Processes	
Industrial Engineering	
Plant and Env. Hazards Eng.	
Test and Evaluation	

Vehicle Applicability

Alternate and Multifuel	
Electric and Hybrid	
Cars and Vans	
Off-road Vehicles	
Trucks, Buses, Trailers	
Specialty Vehicles	

Manufacturing Process Expertise

Metal Manufacturing Processes	
Plastics Manufacturing Processes	
Mfg. Machinery and Equipment	
Robotics	
Other Manufacturing Processes	

Knowledge Specialty

Aero and Fluid Dynamics	
CAD, CAM, CIM	
Finite Element Analysis	
Fuels and Lubricants	
Ergonomics and Industrial Design	
Joining and Fastening	
Materials: Ferrous Metals	
Materials: Non-ferrous Metals	
Materials: Plastics	
Materials: Composites	10
Materials: Rubber	
Materials: Glass	
Materials: Electrical/Electronic	
Finishes and Coatings	
Noise and Vibration	
Simulation and Modelling	
Stress/Strain/Stiffness	
Systems Integration	
Other	10

Automotive Component Specialty

Body and Structure	
Electrical System	
Engines	
Emission Controls	
Heating, Ventilation and A/C	
Instruments and Controls	
Interior Trim and Components	
Steering, Suspension, Brakes	
Transmission	
Safety	
Wheels and Tires	
Diagnostic and Service Equipment	

Affiliations With Other Organizations

Noranda Research Centre (joint research). Pratt and Whitney Canada (joint research). Member, Canadian University-Industry Council on Advanced Ceramics (CUICAC).

R&D Projects

Carbothermic production of non-oxide powders, processing and sintering of Si3N4, mechanics of slip processing, ceramic-metal joining, metal-ceramic and ceramic-ceramic matrix composites, sintering of metal powders, comminution and sintering of reactive aluminas.

Special R&D Facilities

Attrition, ball and shatterbox milling, BET surface area measurement, Sedigraph and laser particle distribution, IR and UV spectrometry, chemical analysis, air and inert gas furnaces (1 800°C), inert and vacuum furnaces (2 500°C), isostatic press, X-ray diffraction, SEM and EDS systems, image analysis, electron microprobe, DTA, DSC equipment, ceramic machining, high temperature testing, viscometer, zeta potential meter, spray dryer. Floor Space Devoted to R&D: Not Reported.

McGill University
Department of Metallurgical Engineering

3450 University Street
MONTREAL, Que.
H3A 2A7

Date of Response: July 27, 1990
Contact: J.E. Gruzleski
Title: Professor
Phone: (514) 398-4365
Fax: (514) 398-4492

Organization Type

Government Laboratory	
Technology Centre	
Community College	
University	Yes
Industrial Company	
Other (including Consulting)	

Total Staffing

1-24 Employees	
25-99 Employees	
100-499 Employees	Yes
500-999 Employees	
1 000+ Employees	
Total Staff	

R&D Staffing

Doctorate Level	50
Master's Level	50
Bachelor's Level	30
Technologists	20
Total R&D Staff	150

Type of R&D Performed

Research	Yes
Product Design	
Manufacturing Processes	Yes
Industrial Engineering	
Plant and Env. Hazards Eng.	
Test and Evaluation	

Vehicle Applicability

Alternate and Multifuel	
Electric and Hybrid	
Cars and Vans	
Off-road Vehicles	
Trucks, Buses, Trailers	
Specialty Vehicles	

Manufacturing Process Expertise

Metal Manufacturing Processes	10
Plastics Manufacturing Processes	
Mfg. Machinery and Equipment	
Robotics	
Other Manufacturing Processes	

Knowledge Specialty

Aero and Fluid Dynamics	
CAD, CAM, CIM	
Finite Element Analysis	10
Fuels and Lubricants	
Ergonomics and Industrial Design	
Joining and Fastening	10
Materials: Ferrous Metals	10
Materials: Non-ferrous Metals	10
Materials: Plastics	
Materials: Composites	
Materials: Rubber	
Materials: Glass	
Materials: Electrical/Electronic	
Finishes and Coatings	
Noise and Vibration	
Simulation and Modelling	
Stress/Strain/Stiffness	
Systems Integration	
Other	

Automotive Component Specialty

Body and Structure	
Electrical System	
Engines	
Emission Controls	
Heating, Ventilation and A/C	
Instruments and Controls	
Interior Trim and Components	
Steering, Suspension, Brakes	
Transmission	
Safety	
Wheels and Tires	
Diagnostic and Service Equipment	

Affiliations With Other Organizations
Canadian steel industry. International aluminum industry. Magnesium producers and fabricators.

R&D Projects
Development of aluminum casting alloys. Liquid metal treatment of aluminum alloys. Elimination of porosity in cast aluminum and magnesium. Working of steel. Strip casting.

Special R&D Facilities
Complete metal characterization facilities. Foundry. Complete mechanical testing facilities. Mathematical modelling. Floor Space Devoted to R&D: Not Reported.

McMaster University

Centre for Flexible Manufacturing Research and Development

JHE-307
1280 Main Street West
HAMILTON, Ont.
L8S 4L7

Date of Response: **March 21, 1990**
Contact: **Professor Hoda A. ElMaraghy**
Title: **Director**
Phone: **(416) 525-9140**
Fax: **(416) 572-9744**

Organization Type

Government Laboratory	
Technology Centre	Yes
Community College	
University	
Industrial Company	
Other (including Consulting)	

Total Staffing

1-24 Employees	Yes
25-99 Employees	
100-499 Employees	
500-999 Employees	
1 000+ Employees	
Total Staff	16

R&D Staffing

Doctorate Level	3
Master's Level	3
Bachelor's Level	10
Technologists	
Total R&D Staff	16

Type of R&D Performed

Research	Yes
Product Design	Yes
Manufacturing Processes	
Industrial Engineering	Yes
Plant and Env. Hazards Eng.	
Test and Evaluation	

Vehicle Applicability

Alternate and Multifuel	
Electric and Hybrid	
Cars and Vans	Yes
Off-road Vehicles	
Trucks, Buses, Trailers	
Specialty Vehicles	

Manufacturing Process Expertise

Metal Manufacturing Processes	
Plastics Manufacturing Processes	
Mfg. Machinery and Equipment	8
Robotics	9
Other Manufacturing Processes	8

Knowledge Specialty

Aero and Fluid Dynamics	
CAD, CAM, CIM	10
Finite Element Analysis	9
Fuels and Lubricants	
Ergonomics and Industrial Design	8
Joining and Fastening	
Materials: Ferrous Metals	8
Materials: Non-ferrous Metals	
Materials: Plastics	
Materials: Composites	
Materials: Rubber	
Materials: Glass	
Materials: Electrical/Electronic	
Finishes and Coatings	
Noise and Vibration	
Simulation and Modelling	10
Stress/Strain/Stiffness	9
Systems Integration	10
Other	

Automotive Component Specialty

Body and Structure	8
Electrical System	
Engines	
Emission Controls	
Heating, Ventilation and A/C	
Instruments and Controls	
Interior Trim and Components	
Steering, Suspension, Brakes	
Transmission	
Safety	
Wheels and Tires	
Diagnostic and Service Equipment	

Affiliations With Other Organizations

None Reported.

R&D Projects

Manufacturing process planning and production control. Automatic generation of robotic assembly sequence. Intelligent product design and manufacture. Control of two-link flexible joint manipulators. Flexible assembly of a family of DC motors. Design and development of a sensor-equipped robot gripper. Investigation into the compliance of SCARA robots. Vision and knowledge-based inspection systems. Robotic spray painting. Graphic and dynamic robot simulation. Manufacturing systems simulation.

Special R&D Facilities

Centre contains a flexible assembly cell with two robotic workstations (Adept 1 and Puma 560), Bosch palletized computerized conveyor, IRI D-256 gray scale vision system, force and tactile sensors, network of Sun workstations. Floor Space Devoted to R&D: 150 m^2.

McMaster University
Department of Mechanical Engineering

HAMILTON, Ont.
L8S 4L7

Date of Response:	**April 2, 1990**
Contact:	**David S. Weaver**
Title:	**Chairman**
Phone:	**(416) 525-9140**
Fax:	**(416) 572-7944**

Organization Type

Government Laboratory	
Technology Centre	
Community College	
University	Yes
Industrial Company	
Other (including Consulting)	

Type of R&D Performed

Research	Yes
Product Design	Yes
Manufacturing Processes	Yes
Industrial Engineering	
Plant and Env. Hazards Eng.	Yes
Test and Evaluation	

Knowledge Specialty

Aero and Fluid Dynamics	10
CAD, CAM, CIM	10
Finite Element Analysis	10
Fuels and Lubricants	3
Ergonomics and Industrial Design	3
Joining and Fastening	
Materials: Ferrous Metals	10
Materials: Non-ferrous Metals	10
Materials: Plastics	10
Materials: Composites	5
Materials: Rubber	
Materials: Glass	10
Materials: Electrical/Electronic	10
Finishes and Coatings	
Noise and Vibration	10
Simulation and Modelling	10
Stress/Strain/Stiffness	10
Systems Integration	5
Other	

Total Staffing

1-24 Employees	
25-99 Employees	
100-499 Employees	
500-999 Employees	
1 000+ Employees	Yes
Total Staff	4 650

Vehicle Applicability

Alternate and Multifuel	
Electric and Hybrid	
Cars and Vans	
Off-road Vehicles	
Trucks, Buses, Trailers	
Specialty Vehicles	

R&D Staffing

Doctorate Level	1100
Master's Level	25
Bachelor's Level	
Technologists	340
Total R&D Staff	1500

Manufacturing Process Expertise

Metal Manufacturing Processes	10
Plastics Manufacturing Processes	10
Mfg. Machinery and Equipment	10
Robotics	10
Other Manufacturing Processes	

Automotive Component Specialty

Body and Structure	
Electrical System	
Engines	
Emission Controls	
Heating, Ventilation and A/C	
Instruments and Controls	
Interior Trim and Components	
Steering, Suspension, Brakes	
Transmission	
Safety	
Wheels and Tires	
Diagnostic and Service Equipment	

Affiliations With Other Organizations

Manufacturing Research Corporation of Ontario (MRCO), Ontario Centre for Materials Research (OCMR), McMaster Institute for Polymer Production Technology (MIPPT).

R&D Projects

Research is basically fundamental in the areas of manufacturing processes (metal forming, cutting, machinability, plastics production processes, etc.). Design for manufacturability. CAD/CAM/CIM. Robotics. Finite element analysis. Dynamics, vibration and noise analysis. Materials research and development (metals, plastics, ceramics). Much of this work is applicable to the automotive industry, and a number of contracts with automobile manufacturers and suppliers are under way.

Special R&D Facilities

Excellent laboratories exist in the areas of metal forming, machine tools and flexible manufacturing systems including presses, tensile testing, milling, lathes, grinders, robots, CAD/CAM work stations, etc.; materials research including electron and optical microscopes, furnaces, a wide variety of materials testing machines; polymer production facilities; etc. Floor Space Devoted to R&D: 35 000 m^2.

McMaster University
Institute for Polymer Production

JHE-136
McMaster University
HAMILTON, Ont.
L8S 4L7

Date of Response: **March 22, 1990**
Contact: **Professor A.E. Hamielec**
Title: **Director**
Phone: **(416) 523-1643**
Fax: **(416) 528-5114**

Organization Type	
Government Laboratory	
Technology Centre	Yes
Community College	
University	
Industrial Company	
Other (including Consulting)	

Total Staffing	
1-24 Employees	Yes
25-99 Employees	
100-499 Employees	
500-999 Employees	
1 000+ Employees	
Total Staff	

R&D Staffing	
Doctorate Level	6
Master's Level	
Bachelor's Level	6
Technologists	
Total R&D Staff	12

Type of R&D Performed	
Research	Yes
Product Design	
Manufacturing Processes	Yes
Industrial Engineering	
Plant and Env. Hazards Eng.	
Test and Evaluation	

Vehicle Applicability	
Alternate and Multifuel	
Electric and Hybrid	
Cars and Vans	
Off-road Vehicles	
Trucks, Buses, Trailers	
Specialty Vehicles	

Manufacturing Process Expertise	
Metal Manufacturing Processes	
Plastics Manufacturing Processes	10
Mfg. Machinery and Equipment	
Robotics	
Other Manufacturing Processes	

Knowledge Specialty	
Aero and Fluid Dynamics	
CAD, CAM, CIM	
Finite Element Analysis	8
Fuels and Lubricants	
Ergonomics and Industrial Design	
Joining and Fastening	
Materials: Ferrous Metals	
Materials: Non-ferrous Metals	
Materials: Plastics	10
Materials: Composites	
Materials: Rubber	10
Materials: Glass	
Materials: Electrical/Electronic	
Finishes and Coatings	
Noise and Vibration	
Simulation and Modelling	10
Stress/Strain/Stiffness	
Systems Integration	
Other	

Automotive Component Specialty	
Body and Structure	
Electrical System	
Engines	
Emission Controls	
Heating, Ventilation and A/C	
Instruments and Controls	
Interior Trim and Components	
Steering, Suspension, Brakes	
Transmission	
Safety	
Wheels and Tires	
Diagnostic and Service Equipment	

Affiliations With Other Organizations
None Reported.

R&D Projects
Development of RIM processes. Modelling of RIM processes.

Special R&D Facilities
Reaction injection moulding (RIM) machines. Twin-screw extruder. Instrumented stainless steel pilot plant. Full characterization equipment. Floor Space Devoted to R&D: 500 m^2.

NARMCO National Auto Radiator Manufacturing Co.

2575 Airport Road
WINDSOR, Ont.
N8W 1Z4

Date of Response: **May 29, 1990**
Contact: **John Rodzik**
Title: **Chief Operating Officer**
Phone: **(519) 969-3350**
Fax: **(519) 969-0063**

Organization Type

Government Laboratory	
Technology Centre	
Community College	
University	
Industrial Company	Yes
Other (including Consulting)	

Total Staffing

1-24 Employees	
25-99 Employees	
100-499 Employees	
500-999 Employees	
1 000+ Employees	Yes
Total Staff	1 200

R&D Staffing

Doctorate Level	
Master's Level	
Bachelor's Level	6
Technologists	
Total R&D Staff	16

Type of R&D Performed

Research	
Product Design	Yes
Manufacturing Processes	Yes
Industrial Engineering	
Plant and Env. Hazards Eng.	
Test and Evaluation	

Vehicle Applicability

Alternate and Multifuel	
Electric and Hybrid	
Cars and Vans	Yes
Off-road Vehicles	Yes
Trucks, Buses, Trailers	Yes
Specialty Vehicles	

Manufacturing Process Expertise

Metal Manufacturing Processes	10
Plastics Manufacturing Processes	
Mfg. Machinery and Equipment	10
Robotics	
Other Manufacturing Processes	7

Knowledge Specialty

Aero and Fluid Dynamics	
CAD, CAM, CIM	8
Finite Element Analysis	
Fuels and Lubricants	8
Ergonomics and Industrial Design	
Joining and Fastening	
Materials: Ferrous Metals	10
Materials: Non-ferrous Metals	
Materials: Plastics	
Materials: Composites	10
Materials: Rubber	
Materials: Glass	
Materials: Electrical/Electronic	
Finishes and Coatings	10
Noise and Vibration	10
Simulation and Modelling	
Stress/Strain/Stiffness	
Systems Integration	
Other	

Automotive Component Specialty

Body and Structure	10
Electrical System	
Engines	10
Emission Controls	
Heating, Ventilation and A/C	
Instruments and Controls	
Interior Trim and Components	
Steering, Suspension, Brakes	
Transmission	10
Safety	
Wheels and Tires	
Diagnostic and Service Equipment	

Affiliations With Other Organizations

Central Stamping Ltd., Falcon Tool and Die (1979) Ltd., KAPCO Tool and Die Ltd., Russell Tool and Die Ltd., J.F.K. Systems Inc., Canadian Electrocoating Ltd., Prince Metal Products.

R&D Projects

Laminated stampings with laminated steel. Welding laminated steel. Painting laminated steel. Laminated products for noise and vibration reduction.

Special R&D Facilities

Full test laboratory for layout, computer, material testing, full finish testing. Full tool, die, fixture and assembly construction capability. Full production capability for stamping, assembly, coating and painting. Floor Space Devoted to R&D: Not Reported.

National Institute of Magnesium Technology

333 Franquet
P.O. Box 9038
SAINTE-FOY, Que.
G1V 4C7

Date of Response: May 14, 1990
Contact: Michael M. Avedesian
Title: Executive Director
Phone: (418) 659-1550
Fax: (418) 652-2251

Organization Type	
Government Laboratory	
Technology Centre	Yes
Community College	
University	
Industrial Company	
Other (including Consulting)	

Total Staffing	
1-24 Employees	Yes
25-99 Employees	
100-499 Employees	
500-999 Employees	
1 000+ Employees	
Total Staff	

R&D Staffing	
Doctorate Level	1
Master's Level	1
Bachelor's Level	2
Technologists	3
Total R&D Staff	10

Type of R&D Performed	
Research	Yes
Product Design	Yes
Manufacturing Processes	Yes
Industrial Engineering	Yes
Plant and Env. Hazards Eng.	Yes
Test and Evaluation	Yes

Vehicle Applicability	
Alternate and Multifuel	
Electric and Hybrid	
Cars and Vans	Yes
Off-road Vehicles	Yes
Trucks, Buses, Trailers	
Specialty Vehicles	

Manufacturing Process Expertise	
Metal Manufacturing Processes	10
Plastics Manufacturing Processes	
Mfg. Machinery and Equipment	8
Robotics	10
Other Manufacturing Processes	

Knowledge Specialty	
Aero and Fluid Dynamics	8
CAD, CAM, CIM	10
Finite Element Analysis	10
Fuels and Lubricants	
Ergonomics and Industrial Design	5
Joining and Fastening	10
Materials: Ferrous Metals	
Materials: Non-ferrous Metals	10
Materials: Plastics	
Materials: Composites	10
Materials: Rubber	
Materials: Glass	
Materials: Electrical/Electronic	2
Finishes and Coatings	8
Noise and Vibration	7
Simulation and Modelling	8
Stress/Strain/Stiffness	10
Systems Integration	7
Other	

Automotive Component Specialty	
Body and Structure	
Electrical System	
Engines	
Emission Controls	
Heating, Ventilation and A/C	
Instruments and Controls	
Interior Trim and Components	
Steering, Suspension, Brakes	
Transmission	
Safety	
Wheels and Tires	
Diagnostic and Service Equipment	

Affiliations With Other Organizations

CRIQ, CANMET, CRM, Laval University.

R&D Projects

Product design using finite element analysis, damping, noise reduction. Prototyping in magnesium. High and low pressure diecasting. New alloy development and metal matrix composites. Materials engineering including corrosion.

Special R&D Facilities

250-t hot chamber diecasting and 600-t cold chamber diecasting machines; furnaces of 147, 204 and 795 kg (325, 450 and 1 750 lbs.) capacity; foundry equipment; metallographic lab; corrosion lab; optical emission spectrometer; real time radioscopy X-ray machine; 1 000 m^2 pilot plant area devoted to transformation technologies. Floor Space Devoted to R&D: 3 000 m^2.

National Optics Institute

369 Franquet
P.O. Box 9970
SAINTE-FOY, Que.
G1V 4C5

Date of Response: May 28, 1990
Contact: Russell Boulay, Eng., PhD
Title: Project Leader
Phone: (418) 657-7006
Fax: (418) 657-7009

Organization Type

Government Laboratory	
Technology Centre	Yes
Community College	
University	
Industrial Company	
Other (including Consulting)	

Total Staffing

1-24 Employees	
25-99 Employees	Yes
100-499 Employees	
500-999 Employees	
1 000+ Employees	
Total Staff	

R&D Staffing

Doctorate Level	22
Master's Level	24
Bachelor's Level	1
Technologists	14
Total R&D Staff	61

Type of R&D Performed

Research	Yes
Product Design	
Manufacturing Processes	
Industrial Engineering	
Plant and Env. Hazards Eng.	Yes
Test and Evaluation	Yes

Vehicle Applicability

Alternate and Multifuel	
Electric and Hybrid	
Cars and Vans	Yes
Off-road Vehicles	
Trucks, Buses, Trailers	Yes
Specialty Vehicles	

Manufacturing Process Expertise

Metal Manufacturing Processes	
Plastics Manufacturing Processes	
Mfg. Machinery and Equipment	
Robotics	3
Other Manufacturing Processes	

Knowledge Specialty

Aero and Fluid Dynamics	
CAD, CAM, CIM	
Finite Element Analysis	
Fuels and Lubricants	
Ergonomics and Industrial Design	
Joining and Fastening	
Materials: Ferrous Metals	
Materials: Non-ferrous Metals	
Materials: Plastics	
Materials: Composites	5
Materials: Rubber	
Materials: Glass	10
Materials: Electrical/Electronic	
Finishes and Coatings	
Noise and Vibration	
Simulation and Modelling	
Stress/Strain/Stiffness	5
Systems Integration	
Other	

Automotive Component Specialty

Body and Structure	
Electrical System	
Engines	
Emission Controls	
Heating, Ventilation and A/C	
Instruments and Controls	10
Interior Trim and Components	
Steering, Suspension, Brakes	
Transmission	
Safety	5
Wheels and Tires	
Diagnostic and Service Equipment	

Affiliations With Other Organizations

None Reported.

R&D Projects

Integrated optical strain gauge as vehicle weight sensor. Laser doppler velocimeter (LDV) for fluid flow, surface displacement, and relative speed measurement. Fibre optic temperature sensor for electrical transformers. Special optics elements: NDT of composite materials. Development of special optical equipment for optical metrology.

Special R&D Facilities

Unique facilities for preforming (MCVD and soot deposition processes) and making optical fibres (two-fibre pulling towers). Full clean room with state-of-the-art tooling. Integrated optics fabrication and characterization. Optical design and testing: holographic labs with various lasers (Ar, Kr, He-Cd); chemical vapour deposition (CVD) systems; IR GRIN crystal pulling; microwave ECR deposition and etching; HOE for robotic vision. Floor Space Devoted to R&D: 5 000 m^2.

National Research Council of Canada
Environmental Protection Science

OTTAWA, Ont.
K1A 0R6

Date of Response: March 22, 1990
Contact: Dr. Michael Day
Title: Research Scientist
Phone: (613) 993-2268
Fax: (613) 952-1275

Organization Type	
Government Laboratory	Yes
Technology Centre	
Community College	
University	
Industrial Company	
Other (including Consulting)	

Total Staffing	
1-24 Employees	
25-99 Employees	
100-499 Employees	
500-999 Employees	
1 000+ Employees	Yes
Total Staff	

R&D Staffing	
Doctorate Level	2
Master's Level	
Bachelor's Level	1
Technologists	1
Total R&D Staff	4

Type of R&D Performed	
Research	Yes
Product Design	
Manufacturing Processes	
Industrial Engineering	
Plant and Env. Hazards Eng.	
Test and Evaluation	Yes

Vehicle Applicability	
Alternate and Multifuel	
Electric and Hybrid	
Cars and Vans	Yes
Off-road Vehicles	
Trucks, Buses, Trailers	
Specialty Vehicles	

Manufacturing Process Expertise	
Metal Manufacturing Processes	
Plastics Manufacturing Processes	8
Mfg. Machinery and Equipment	
Robotics	
Other Manufacturing Processes	

Knowledge Specialty	
Aero and Fluid Dynamics	
CAD, CAM, CIM	
Finite Element Analysis	
Fuels and Lubricants	
Ergonomics and Industrial Design	
Joining and Fastening	
Materials: Ferrous Metals	
Materials: Non-ferrous Metals	
Materials: Plastics	10
Materials: Composites	10
Materials: Rubber	7
Materials: Glass	
Materials: Electrical/Electronic	5
Finishes and Coatings	5
Noise and Vibration	
Simulation and Modelling	
Stress/Strain/Stiffness	
Systems Integration	
Other	

Automotive Component Specialty
Body and Structure
Electrical System
Engines
Emission Controls
Heating, Ventilation and A/C
Instruments and Controls
Interior Trim and Components
Steering, Suspension, Brakes
Transmission
Safety
Wheels and Tires
Diagnostic and Service Equipment

Affiliations With Other Organizations
Other divisions of NRC. SPI Canada.

R&D Projects
Thermal durability of polymers and plastic composites. Recycling, reusing and recovering polymeric waste from automobiles.

Special R&D Facilities
Material characterization: spectrometers, thermal analyzers, environmental chambers, mechanical testers. Floor Space Devoted to R&D: 300 m^2.

National Research Council of Canada
Industrial Materials Research Institute

75 de Mortagne Boulevard
BOUCHERVILLE, Que.
J4B 6Y4

Date of Response: March 26, 1990
Contact: Dr. Jacques G. Martel
Title: Director
Phone: (514) 641-2280
Fax: (514) 641-3566

Organization Type

Government Laboratory	Yes
Technology Centre	
Community College	
University	
Industrial Company	
Other (including Consulting)	

Total Staffing

1-24 Employees	
25-99 Employees	
100-499 Employees	Yes
500-999 Employees	
1 000+ Employees	
Total Staff	131

R&D Staffing

Doctorate Level	25
Master's Level	35
Bachelor's Level	5
Technologists	40
Total R&D Staff	105

Type of R&D Performed

Research	Yes
Product Design	Yes
Manufacturing Processes	
Industrial Engineering	Yes
Plant and Env. Hazards Eng.	
Test and Evaluation	Yes

Vehicle Applicability

Alternate and Multifuel	
Electric and Hybrid	
Cars and Vans	Yes
Off-road Vehicles	Yes
Trucks, Buses, Trailers	Yes
Specialty Vehicles	Yes

Manufacturing Process Expertise

Metal Manufacturing Processes	8
Plastics Manufacturing Processes	10
Mfg. Machinery and Equipment	
Robotics	5
Other Manufacturing Processes	

Knowledge Specialty

Aero and Fluid Dynamics	
CAD, CAM, CIM	10
Finite Element Analysis	10
Fuels and Lubricants	
Ergonomics and Industrial Design	5
Joining and Fastening	5
Materials: Ferrous Metals	5
Materials: Non-ferrous Metals	5
Materials: Plastics	5
Materials: Composites	5
Materials: Rubber	5
Materials: Glass	
Materials: Electrical/Electronic	
Finishes and Coatings	5
Noise and Vibration	
Simulation and Modelling	5
Stress/Strain/Stiffness	5
Systems Integration	5
Other	

Automotive Component Specialty

Body and Structure	5
Electrical System	5
Engines	
Emission Controls	
Heating, Ventilation and A/C	
Instruments and Controls	10
Interior Trim and Components	5
Steering, Suspension, Brakes	
Transmission	
Safety	
Wheels and Tires	
Diagnostic and Service Equipment	

Affiliations With Other Organizations

National Research Council of Canada

R&D Projects

Development of ultrasonic and laser ultrasonic sensors for NT evaluation. ND characterization of materials. Optical inspection. Ceramics development. Manufacturing of superconductors. Strip casting of metals. Development of plastics and their forming. Computer-integrated materials processes: injection moulding and blow moulding of plastics, elastomers and composites. Diecasting of metallic alloys and composites.

Special R&D Facilities

Instrumentation and sensors; metals, alloys and metal matrix composites; plastics and polymeric composites; computer-aided materials processing; CAD/CAM facilities; plastics-forming research facilities at pilot scale level; simulation (mathematical and physical) of diecasting and squeeze-casting processes; small scale R&D facilities for development of sensors; metallurgical and chemical analytical facilities. Floor Space Devoted to R&D: 11 000 m^2.

Northern Alberta Institute of Technology

11762-106 Street
EDMONTON, Alta.
T5G 2R1

Date of Response: July 2, 1990
Contact: Ken Ohashi
Title: Director, Applied Research
Phone: (403) 471-7524
Fax: (403) 471-8583

Organization Type	
Government Laboratory	
Technology Centre	
Community College	Yes
University	
Industrial Company	
Other (including Consulting)	

Total Staffing	
1-24 Employees	
25-99 Employees	
100-499 Employees	
500-999 Employees	Yes
1 000+ Employees	
Total Staff	1465

R&D Staffing	
Doctorate Level	15
Master's Level	215
Bachelor's Level	400
Technologists	94
Total R&D Staff	724

Type of R&D Performed	
Research	Yes
Product Design	Yes
Manufacturing Processes	Yes
Industrial Engineering	Yes
Plant & Env. Hazards Eng.	Yes
Test & Evaluation	Yes

Vehicle Applicability	
Alternate & Multifuel	Yes
Electric & Hybrid	Yes
Cars & Vans	Yes
Off-road Vehicles	Yes
Trucks, Buses, Trailers	Yes
Specialty Vehicles	Yes

Manufacturing Process Expertise	
Metal Manufacturing Processes	5
Plastics Manufacturing Processes	5
Mfg. Machinery & Equipment	5
Robotics	5
Other Manufacturing Processes	5

Knowledge Specialty	
Aero & Fluid Dynamics	5
CAD, CAM, CIM	5
Finite Element Analysis	5
Fuels & Lubricants	5
Ergonomics & Industrial Design	5
Joining & Fastening	5
Materials: Ferrous Metals	5
Materials: Non-ferrous Metals	5
Materials: Plastics	5
Materials: Composites	5
Materials: Rubber	5
Materials: Glass	5
Materials: Electrical/Electronic	5
Finishes & Coatings	5
Noise & Vibration	5
Simulation & Modelling	5
Stress/Strain/Stiffness	5
Systems Integration	5
Other	5

Automotive Component Specialty	
Body & Structure	5
Electrical System	5
Engines	5
Emission Controls	5
Heat, Vent & A/C	5
Instruments & Controls	5
Interior Trim & Components	5
Steering, Suspension, Brakes	5
Transmission	5
Safety	5
Wheels & Tires	5
Diagnostic & Service Eqpmt.	5

Affiliations With Other Organizations

Alberta Research Council, Canadian Manufacturers Association, General Motors, Ford, Chrysler, Transport Canada, Alberta Laser Institute, National Research Council.

R&D Projects

Materials testing. Fuels analysis. Metrology. Product testing.

Special R&D Facilities

Note: R&D staffing data apply to instructional staff available for R&D. Total floor space is 170 000 m^2.

ORTECH International

2395 Speakman Drive
MISSISSAUGA, Ont.
L5K 1B3

Date of Response: **June 15, 1990**
Contact: **Bill MacDonald**
Title: **Marketing Manager, Transportation Systems**
Phone: **(416) 822-4111**
Fax: **(416) 823-1446**

Organization Type

Government Laboratory	
Technology Centre	
Community College	
University	
Industrial Company	
Other (including Consulting)	Yes

Total Staffing

1-24 Employees	
25-99 Employees	
100-499 Employees	Yes
500-999 Employees	
1 000+ Employees	
Total Staff	350

R&D Staffing

Doctorate Level	
Master's Level	
Bachelor's Level	
Technologists	
Total R&D Staff	

Type of R&D Performed

Research	Yes
Product Design	Yes
Manufacturing Processes	Yes
Industrial Engineering	Yes
Plant and Env. Hazards Eng.	Yes
Test and Evaluation	Yes

Vehicle Applicability

Alternate and Multifuel	Yes
Electric and Hybrid	Yes
Cars and Vans	Yes
Off-road Vehicles	Yes
Trucks, Buses, Trailers	Yes
Specialty Vehicles	Yes

Manufacturing Process Expertise

Metal Manufacturing Processes	5
Plastics Manufacturing Processes	8
Mfg. Machinery and Equipment	2
Robotics	2
Other Manufacturing Processes	

Knowledge Specialty

Aero and Fluid Dynamics	7
CAD, CAM, CIM	7
Finite Element Analysis	10
Fuels and Lubricants	10
Ergonomics and Industrial Design	3
Joining and Fastening	3
Materials: Ferrous Metals	9
Materials: Non-ferrous Metals	9
Materials: Plastics	9
Materials: Composites	7
Materials: Rubber	7
Materials: Glass	5
Materials: Electrical/Electronic	7
Finishes and Coatings	9
Noise and Vibration	5
Simulation and Modelling	9
Stress/Strain/Stiffness	9
Systems Integration	6
Other	

Automotive Component Specialty

Body and Structure	9
Electrical System	8
Engines	9
Emission Controls	9
Heating, Ventilation and A/C	5
Instruments and Controls	5
Interior Trim and Components	4
Steering, Suspension, Brakes	4
Transmission	4
Safety	4
Wheels and Tires	4
Diagnostic and Service Equipment	

Affiliations With Other Organizations

None Reported.

R&D Projects

Durability of plastic components (analysis). Alternative fuels evaluation. Heavy duty engine redesign. Vehicle structure durability predictions. Emissions evaluation. Non-linear finite element analysis.

Special R&D Facilities

MTS 4 post tire coupled simulator. Drive-in environmental chambers. Solar test facility (150 kW). Polymer and metal full service test equipment. Electron microscopes. Spectrometers. Nine engine test cells including capabilities. Exhaust analysis equipment. Ideas modelling software. Floor Space Devoted to R&D: 28 000 m^2.

Ontario Centre for Materials Research

P.O. Box 1146
KINGSTON, Ont.
K7L 4Y5

Date of Response: **April 6, 1990**
Contact: **Dr. J.P. McGeer**
Title: **Managing Director**
Phone: **(613) 545-6519**
Fax: **(613) 545-6510**

Organization Type

Government Laboratory	
Technology Centre	Yes
Community College	
University	
Industrial Company	
Other (including Consulting)	

Total Staffing

1-24 Employees	
25-99 Employees	
100-499 Employees	Yes
500-999 Employees	
1 000+ Employees	
Total Staff	

R&D Staffing

Doctorate Level	75
Master's Level	
Bachelor's Level	
Technologists	100
Total R&D Staff	200

Type of R&D Performed

Research	Yes
Product Design	
Manufacturing Processes	
Industrial Engineering	
Plant and Env. Hazards Eng.	
Test and Evaluation	

Vehicle Applicability

Alternate and Multifuel	Yes
Electric and Hybrid	Yes
Cars and Vans	Yes
Off-road Vehicles	Yes
Trucks, Buses, Trailers	Yes
Specialty Vehicles	Yes

Manufacturing Process Expertise

Metal Manufacturing Processes	
Plastics Manufacturing Processes	
Mfg. Machinery and Equipment	
Robotics	
Other Manufacturing Processes	

Knowledge Specialty

Aero and Fluid Dynamics	
CAD, CAM, CIM	
Finite Element Analysis	5
Fuels and Lubricants	
Ergonomics and Industrial Design	
Joining and Fastening	5
Materials: Ferrous Metals	5
Materials: Non-ferrous Metals	5
Materials: Plastics	5
Materials: Composites	5
Materials: Rubber	
Materials: Glass	
Materials: Electrical/Electronic	5
Finishes and Coatings	5
Noise and Vibration	
Simulation and Modelling	5
Stress/Strain/Stiffness	5
Systems Integration	
Other	

Automotive Component Specialty

Body and Structure	
Electrical System	
Engines	
Emission Controls	
Heating, Ventilation and A/C	
Instruments and Controls	
Interior Trim and Components	
Steering, Suspension, Brakes	
Transmission	
Safety	
Wheels and Tires	
Diagnostic and Service Equipment	

Affiliations With Other Organizations

McMaster University, Queen's University, University of Toronto, University of Waterloo, University of Western Ontario.

R&D Projects

New crystalline materials, research on ceramics and glasses, joining of materials, including laser welding and brazing, research for the metals industry, electroluminescent materials for displays, polymer blends and alloys, advanced carbon-carbon materials.

Special R&D Facilities

Extensive facilities in the areas of metals and ceramics, optoelectronics, and polymers and composites. Floor Space Devoted to R&D: Not Reported.

Pavaco Plastics Inc.

611 Imperial Road
GUELPH, Ont.
N1H 7M2

Date of Response: March 28, 1990
Contact: Jussi Paronen
Title: Technical Director
Phone: (519) 823-5770
Fax: (519) 823-1944

Organization Type	
Government Laboratory	
Technology Centre	
Community College	
University	
Industrial Company	Yes
Other (including Consulting)	

Total Staffing	
1-24 Employees	Yes
25-99 Employees	
100-499 Employees	
500-999 Employees	
1 000+ Employees	
Total Staff	18

R&D Staffing	
Doctorate Level	
Master's Level	4
Bachelor's Level	1
Technologists	2
Total R&D Staff	7

Type of R&D Performed	
Research	Yes
Product Design	Yes
Manufacturing Processes	Yes
Industrial Engineering	Yes
Plant and Env. Hazards Eng.	
Test and Evaluation	

Vehicle Applicability	
Alternate and Multifuel	
Electric and Hybrid	
Cars and Vans	Yes
Off-road Vehicles	
Trucks, Buses, Trailers	Yes
Specialty Vehicles	

Manufacturing Process Expertise	
Metal Manufacturing Processes	
Plastics Manufacturing Processes	8
Mfg. Machinery and Equipment	8
Robotics	4
Other Manufacturing Processes	5

Knowledge Specialty	
Aero and Fluid Dynamics	
CAD, CAM, CIM	2
Finite Element Analysis	
Fuels and Lubricants	
Ergonomics and Industrial Design	
Joining and Fastening	8
Materials: Ferrous Metals	
Materials: Non-ferrous Metals	
Materials: Plastics	8
Materials: Composites	1
Materials: Rubber	1
Materials: Glass	
Materials: Electrical/Electronic	
Finishes and Coatings	
Noise and Vibration	10
Simulation and Modelling	2
Stress/Strain/Stiffness	
Systems Integration	
Other	5

Automotive Component Specialty	
Body and Structure	3
Electrical System	
Engines	
Emission Controls	
Heating, Ventilation and A/C	3
Instruments and Controls	
Interior Trim and Components	8
Steering, Suspension, Brakes	
Transmission	
Safety	
Wheels and Tires	
Diagnostic and Service Equipment	

Affiliations With Other Organizations

Pavaco is parent company of Hematite Manufacturing and Genesta Manufacturing.

R&D Projects

Developing automotive door water shield. Developing process to separate aluminum and tape from body side moulding to allow re-use of flexible PVC. Developing in-line plastics extrusion and thermoforming several sound barrier auto parts. Developing low-fogging and high durometer PVC compounds.

Special R&D Facilities

Plastics testing laboratory: equipment such as: Lab Mill (two-roll), tensile tester, fog-testing apparatus, melt flow tester, specific gravity tester. Sound testing laboratory (see Hematite Manufacturing entry for information). Floor Space Devoted to R&D: Not Reported.

Protrans Design Team

2159 Alconbury Crescent
BURLINGTON, Ont.
L7P 3C5

Date of Response: April 3, 1990
Contact: Paul R. Almas, AOCA, ACIDO
Title: Vice-president
Phone: (416) 336-1974
Fax: (416) 336-1974

Organization Type	
Government Laboratory	
Technology Centre	
Community College	
University	
Industrial Company	
Other (including Consulting)	Yes

Total Staffing	
1-24 Employees	Yes
25-99 Employees	
100-499 Employees	
500-999 Employees	
1 000+ Employees	
Total Staff	

R&D Staffing	
Doctorate Level	
Master's Level	
Bachelor's Level	2
Technologists	2
Total R&D Staff	4

Type of R&D Performed	
Research	Yes
Product Design	Yes
Manufacturing Processes	
Industrial Engineering	
Plant and Env. Hazards Eng.	
Test and Evaluation	

Vehicle Applicability	
Alternate and Multifuel	Yes
Electric and Hybrid	Yes
Cars and Vans	Yes
Off-road Vehicles	Yes
Trucks, Buses, Trailers	Yes
Specialty Vehicles	Yes

Manufacturing Process Expertise	
Metal Manufacturing Processes	
Plastics Manufacturing Processes	
Mfg. Machinery and Equipment	
Robotics	
Other Manufacturing Processes	

Knowledge Specialty	
Aero and Fluid Dynamics	
CAD, CAM, CIM	5
Finite Element Analysis	
Fuels and Lubricants	
Ergonomics and Industrial Design	10
Joining and Fastening	
Materials: Ferrous Metals	5
Materials: Non-ferrous Metals	5
Materials: Plastics	5
Materials: Composites	5
Materials: Rubber	5
Materials: Glass	5
Materials: Electrical/Electronic	
Finishes and Coatings	5
Noise and Vibration	
Simulation and Modelling	5
Stress/Strain/Stiffness	
Systems Integration	5
Other	

Automotive Component Specialty	
Body and Structure	5
Electrical System	
Engines	
Emission Controls	
Heating, Ventilation and A/C	
Instruments and Controls	
Interior Trim and Components	5
Steering, Suspension, Brakes	
Transmission	
Safety	
Wheels and Tires	
Diagnostic and Service Equipment	

Affiliations With Other Organizations

Association of Chartered Industrial Designers of Ontario (ACIDO), Industrial Design Society of America (IDSA).

R&D Projects

Toronto Wheeltrans bus. Girardin SB 1000 disabled persons transit unit.

Special R&D Facilities

Automotive and mass transportation design and styling. Floor Space Devoted to R&D: Not Reported.

Queen's University
Department of Chemistry

Frost Wing
KINGSTON, Ont.
K7L 3N6

Date of Response: April 12, 1990
Contact: Dr. Warren Baker
Title: Professor
Phone: (613) 545-2621
Fax: (613) 545-6669

Organization Type

Government Laboratory	
Technology Centre	
Community College	
University	Yes
Industrial Company	
Other (including Consulting)	

Total Staffing

1-24 Employees	
25-99 Employees	
100-499 Employees	
500-999 Employees	
1 000+ Employees	Yes
Total Staff	

R&D Staffing

Doctorate Level	2
Master's Level	
Bachelor's Level	
Technologists	1
Total R&D Staff	10

Type of R&D Performed

Research	Yes
Product Design	
Manufacturing Processes	
Industrial Engineering	
Plant and Env. Hazards Eng.	
Test and Evaluation	Yes

Vehicle Applicability

Alternate and Multifuel	
Electric and Hybrid	
Cars and Vans	
Off-road Vehicles	
Trucks, Buses, Trailers	
Specialty Vehicles	

Manufacturing Process Expertise

Metal Manufacturing Processes	
Plastics Manufacturing Processes	5
Mfg. Machinery and Equipment	
Robotics	
Other Manufacturing Processes	

Knowledge Specialty

Aero and Fluid Dynamics	
CAD, CAM, CIM	
Finite Element Analysis	
Fuels and Lubricants	
Ergonomics and Industrial Design	
Joining and Fastening	
Materials: Ferrous Metals	
Materials: Non-ferrous Metals	
Materials: Plastics	9
Materials: Composites	5
Materials: Rubber	5
Materials: Glass	
Materials: Electrical/Electronic	
Finishes and Coatings	
Noise and Vibration	
Simulation and Modelling	
Stress/Strain/Stiffness	
Systems Integration	
Other	

Automotive Component Specialty

Body and Structure	
Electrical System	
Engines	
Emission Controls	
Heating, Ventilation and A/C	
Instruments and Controls	
Interior Trim and Components	
Steering, Suspension, Brakes	
Transmission	
Safety	
Wheels and Tires	
Diagnostic and Service Equipment	

Affiliations With Other Organizations
Note: data is for polymer materials development lab only.

R&D Projects
Instrumented impact testing of polyethylene and polymer alloys. Preparation of polymer alloys. Reactive blending of polymers and scrap rubber tires.

Special R&D Facilities
Rheometrics instrumented impact tester. Twin screw extruder for making polymer compounds. Batch melt mixer for making polymer compounds. Floor Space Devoted to R&D: 250 m^2.

Queen's University
Department of Mechanical Engineering

KINGSTON, Ont.
K7L 3N6

Date of Response: April 16, 1990
Contact: **Professor Ronald J. Anderson**
Title: **Head**
Phone: **(613) 545-2575**
Fax: **(613) 545-6489**

Organization Type

Government Laboratory	
Technology Centre	
Community College	
University	Yes
Industrial Company	
Other (including Consulting)	

Total Staffing

1-24 Employees	
25-99 Employees	Yes
100-499 Employees	
500-999 Employees	
1 000+ Employees	
Total Staff	

R&D Staffing

Doctorate Level	20
Master's Level	5
Bachelor's Level	
Technologists	7
Total R&D Staff	32

Type of R&D Performed

Research	Yes
Product Design	
Manufacturing Processes	
Industrial Engineering	
Plant and Env. Hazards Eng.	
Test and Evaluation	

Vehicle Applicability

Alternate and Multifuel	
Electric and Hybrid	
Cars and Vans	Yes
Off-road Vehicles	Yes
Trucks, Buses, Trailers	Yes
Specialty Vehicles	Yes

Manufacturing Process Expertise

Metal Manufacturing Processes	
Plastics Manufacturing Processes	
Mfg. Machinery and Equipment	5
Robotics	5
Other Manufacturing Processes	

Knowledge Specialty

Aero and Fluid Dynamics	10
CAD, CAM, CIM	7
Finite Element Analysis	5
Fuels and Lubricants	
Ergonomics and Industrial Design	8
Joining and Fastening	5
Materials: Ferrous Metals	
Materials: Non-ferrous Metals	
Materials: Plastics	
Materials: Composites	
Materials: Rubber	
Materials: Glass	
Materials: Electrical/Electronic	
Finishes and Coatings	
Noise and Vibration	10
Simulation and Modelling	10
Stress/Strain/Stiffness	10
Systems Integration	5
Other	

Automotive Component Specialty

Body and Structure	5
Electrical System	
Engines	7
Emission Controls	
Heating, Ventilation and A/C	5
Instruments and Controls	
Interior Trim and Components	
Steering, Suspension, Brakes	10
Transmission	5
Safety	5
Wheels and Tires	
Diagnostic and Service Equipment	

Affiliations With Other Organizations

Gabriel of Canada, National Defence.

R&D Projects

Shock absorber testing machine (design and prototype manufacture). Active suspension for a 1/4-tonne vehicle (design, build and model). Dynamic simulation of road vehicles.

Special R&D Facilities

Wind tunnels, engine test laboratory, machine shop, vibration/noise laboratory, structural test laboratory. Floor Space Devoted to R&D: Not Reported.

Queen's University
Department of Metallurgical Engineering

KINGSTON, Ont.
K7L 3N6

Date of Response: **April 19, 1990**
Contact: **Dr. R.W. Smith**
Title: **Professor and Head**
Phone: **(613) 545-2754**
Fax: **(613) 545-6610**

Organization Type

Government Laboratory	
Technology Centre	
Community College	
University	Yes
Industrial Company	
Other (including Consulting)	

Total Staffing

1-24 Employees	Yes
25-99 Employees	
100-499 Employees	
500-999 Employees	
1 000+ Employees	
Total Staff	

R&D Staffing

Doctorate Level	16
Master's Level	30
Bachelor's Level	
Technologists	2
Total R&D Staff	

Type of R&D Performed

Research	Yes
Product Design	
Manufacturing Processes	
Industrial Engineering	
Plant and Env. Hazards Eng.	
Test and Evaluation	Yes

Vehicle Applicability

Alternate and Multifuel	
Electric and Hybrid	
Cars and Vans	
Off-road Vehicles	
Trucks, Buses, Trailers	
Specialty Vehicles	

Manufacturing Process Expertise

Metal Manufacturing Processes	9
Plastics Manufacturing Processes	
Mfg. Machinery and Equipment	
Robotics	
Other Manufacturing Processes	

Knowledge Specialty

Aero and Fluid Dynamics	
CAD, CAM, CIM	
Finite Element Analysis	7
Fuels and Lubricants	
Ergonomics and Industrial Design	
Joining and Fastening	
Materials: Ferrous Metals	10
Materials: Non-ferrous Metals	10
Materials: Plastics	6
Materials: Composites	10
Materials: Rubber	6
Materials: Glass	8
Materials: Electrical/Electronic	
Finishes and Coatings	8
Noise and Vibration	
Simulation and Modelling	9
Stress/Strain/Stiffness	10
Systems Integration	
Other	

Automotive Component Specialty

Body and Structure	
Electrical System	
Engines	
Emission Controls	
Heating, Ventilation and A/C	
Instruments and Controls	
Interior Trim and Components	
Steering, Suspension, Brakes	
Transmission	
Safety	
Wheels and Tires	
Diagnostic and Service Equipment	

Affiliations With Other Organizations

ALCAN, Falconbridge, INCO, Dofasco, Stelco.

R&D Projects

Development of metal-matrix composites and ceramic-matrix composites. Cast steels, cast irons, development of rolling texture. HSLA steels, hard materials.

Special R&D Facilities

Metallographic, X-ray, TEM, SEM, DSC, rolling texture, foundry mechanical testing, rolling, analytical, welding, squeeze casting, composite infiltration, high temperature/pressure press, high temperature furnaces, crystal growth apparatus. Floor Space Devoted to R&D: Not Reported.

Rockwell International of Canada Ltd.

345 Ecclestone Drive
P.O. Box 900
BRACEBRIDGE, Ont.
P0B 1C0

Date of Response: **April 3, 1990**
Contact: **Dan Brooks**
Title: **Manager of Human Resources**
Phone: **(705) 645-5272**
Fax: **(705) 645-2603**

Organization Type	
Government Laboratory	
Technology Centre	
Community College	
University	
Industrial Company	Yes
Other (including Consulting)	

Total Staffing	
1-24 Employees	
25-99 Employees	
100-499 Employees	Yes
500-999 Employees	
1 000+ Employees	
Total Staff	

R&D Staffing	
Doctorate Level	
Master's Level	
Bachelor's Level	6
Technologists	2
Total R&D Staff	8

Type of R&D Performed	
Research	
Product Design	Yes
Manufacturing Processes	Yes
Industrial Engineering	Yes
Plant and Env. Hazards Eng.	
Test and Evaluation	Yes

Vehicle Applicability	
Alternate and Multifuel	
Electric and Hybrid	
Cars and Vans	Yes
Off-road Vehicles	
Trucks, Buses, Trailers	
Specialty Vehicles	

Manufacturing Process Expertise	
Metal Manufacturing Processes	7
Plastics Manufacturing Processes	3
Mfg. Machinery and Equipment	9
Robotics	8
Other Manufacturing Processes	

Knowledge Specialty			
Aero and Fluid Dynamics	1	Finishes and Coatings	2
CAD, CAM, CIM	6	Noise and Vibration	5
Finite Element Analysis	2	Simulation and Modelling	2
Fuels and Lubricants	1	Stress/Strain/Stiffness	2
Ergonomics and Industrial Design	6	Systems Integration	7
Joining and Fastening	7	Other	
Materials: Ferrous Metals	6		
Materials: Non-ferrous Metals	3		
Materials: Plastics	4		
Materials: Composites	1		
Materials: Rubber	1		
Materials: Glass			
Materials: Electrical/Electronic	1		

Automotive Component Specialty	
Body and Structure	7
Electrical System	
Engines	
Emission Controls	
Heating, Ventilation and A/C	
Instruments and Controls	
Interior Trim and Components	7
Steering, Suspension, Brakes	
Transmission	
Safety	6
Wheels and Tires	
Diagnostic and Service Equipment	

Affiliations With Other Organizations

Rockwell International Auto Body Systems. ARCAD (Association of Renault Chrysler Automotive Design).

R&D Projects

None Reported.

Special R&D Facilities

Prototype Area. Design Office with two CV CADDS 4X work stations, one 8-pen plotter. Ten Autocad stations. LAN. Floor Space Devoted to R&D: 400 m^2.

Rutenberg Design Inc.

130 18th Ave.
LACHINE, Que.
H8S 3P7

Date of Response: March 19, 1990
Contact: Uwe Rutenberg
Title: President
Phone: (514) 634-8939

Organization Type

Government Laboratory	
Technology Centre	
Community College	
University	
Industrial Company	
Other (including Consulting)	Yes

Total Staffing

1-24 Employees	Yes
25-99 Employees	
100-499 Employees	
500-999 Employees	
1 000+ Employees	
Total Staff	

R&D Staffing

Doctorate Level	
Master's Level	1
Bachelor's Level	2
Technologists	
Total R&D Staff	3

Type of R&D Performed

Research	Yes
Product Design	Yes
Manufacturing Processes	
Industrial Engineering	
Plant and Env. Hazards Eng.	
Test and Evaluation	

Vehicle Applicability

Alternate and Multifuel	
Electric and Hybrid	Yes
Cars and Vans	
Off-road Vehicles	
Trucks, Buses, Trailers	Yes
Specialty Vehicles	Yes

Manufacturing Process Expertise

Metal Manufacturing Processes
Plastics Manufacturing Processes
Mfg. Machinery and Equipment
Robotics
Other Manufacturing Processes

Knowledge Specialty

Aero and Fluid Dynamics	
CAD, CAM, CIM	
Finite Element Analysis	
Fuels and Lubricants	
Ergonomics and Industrial Design	10
Joining and Fastening	
Materials: Ferrous Metals	
Materials: Non-ferrous Metals	
Materials: Plastics	
Materials: Composites	
Materials: Rubber	
Materials: Glass	
Materials: Electrical/Electronic	
Finishes and Coatings	
Noise and Vibration	
Simulation and Modelling	
Stress/Strain/Stiffness	
Systems Integration	
Other	

Automotive Component Specialty

Body and Structure
Electrical System
Engines
Emission Controls
Heating, Ventilation and A/C
Instruments and Controls
Interior Trim and Components
Steering, Suspension, Brakes
Transmission
Safety
Wheels and Tires
Diagnostic and Service Equipment

Affiliations With Other Organizations

Partner in TESCAR Inc., a manufacturer producing Rutenberg-designed electric vehicles.

R&D Projects

Electric vehicles for inter-terminal airport passenger service. Electric people mover for museum. Elevator lift for inter-city buses. Accessible washroom for inter-city buses.

Special R&D Facilities

Workshops for model-making, full-scale mockups, and prototypes. Floor Space Devoted to R&D: 300 m^2.

Ryerson Polytechnical Institute
Office of Research and Innovation

350 Victoria Street
TORONTO, Ont.
M5B 2K3

Date of Response: April 5, 1990
Contact: S. Guerin
Title: Project Manager
Phone: (416) 979-5042
Fax: (416) 979-5336

Organization Type	
Government Laboratory	
Technology Centre	
Community College	
University	Yes
Industrial Company	
Other (including Consulting)	

Total Staffing	
1-24 Employees	
25-99 Employees	
100-499 Employees	
500-999 Employees	
1 000+ Employees	
Total Staff	550

R&D Staffing	
Doctorate Level	
Master's Level	
Bachelor's Level	
Technologists	
Total R&D Staff	120

Type of R&D Performed	
Research	Yes
Product Design	
Manufacturing Processes	Yes
Industrial Engineering	Yes
Plant and Env. Hazards Eng.	
Test and Evaluation	

Vehicle Applicability	
Alternate and Multifuel	
Electric and Hybrid	
Cars and Vans	
Off-road Vehicles	
Trucks, Buses, Trailers	
Specialty Vehicles	

Manufacturing Process Expertise	
Metal Manufacturing Processes	4
Plastics Manufacturing Processes	5
Mfg. Machinery and Equipment	5
Robotics	6
Other Manufacturing Processes	5

Knowledge Specialty	
Aero and Fluid Dynamics	8
CAD, CAM, CIM	8
Finite Element Analysis	7
Fuels and Lubricants	5
Ergonomics and Industrial Design	4
Joining and Fastening	5
Materials: Ferrous Metals	4
Materials: Non-ferrous Metals	4
Materials: Plastics	4
Materials: Composites	3
Materials: Rubber	3
Materials: Glass	3
Materials: Electrical/Electronic	7
Finishes and Coatings	6
Noise and Vibration	5
Simulation and Modelling	7
Stress/Strain/Stiffness	6
Systems Integration	3
Other	

Automotive Component Specialty	
Body and Structure	3
Electrical System	6
Engines	5
Emission Controls	6
Heating, Ventilation and A/C	4
Instruments and Controls	6
Interior Trim and Components	4
Steering, Suspension, Brakes	5
Transmission	5
Safety	6
Wheels and Tires	2
Diagnostic and Service Equipment	

Affiliations With Other Organizations

ASME, IEEE. Several industrial partners.

R&D Projects

Evaporative foam casting of automotive parts. Road safety research team (Transport Canada).

Special R&D Facilities

Mechanical finite element analysis. Non-intrusive stress analysis by pulse laser. CNC lab. CAT 1A software lab. Complete laser and holography lab. Combustion calorimetry lab. Engine evaluation lab. Floor Space Devoted to R&D: 5 000 m^2.

SKD Company

Suite 102
1090 University Street West
WINDSOR, Ont.
N9A 5S4

Date of Response: **July 20, 1990**
Contact: **J. Curtin**
Title: **Director of Sales and Engineering**
Phone: **(519) 977-6010**
Fax: **(519) 977-6742**

Organization Type	
Government Laboratory	
Technology Centre	
Community College	
University	
Industrial Company	Yes
Other (including Consulting)	

Total Staffing	
1-24 Employees	
25-99 Employees	
100-499 Employees	Yes
500-999 Employees	
1 000+ Employees	
Total Staff	

R&D Staffing	
Doctorate Level	
Master's Level	
Bachelor's Level	4
Technologists	4
Total R&D Staff	8

Type of R&D Performed	
Research	
Product Design	Yes
Manufacturing Processes	
Industrial Engineering	
Plant and Env. Hazards Eng.	
Test and Evaluation	

Vehicle Applicability	
Alternate and Multifuel	
Electric and Hybrid	
Cars and Vans	Yes
Off-road Vehicles	
Trucks, Buses, Trailers	Yes
Specialty Vehicles	

Manufacturing Process Expertise	
Metal Manufacturing Processes	10
Plastics Manufacturing Processes	
Mfg. Machinery and Equipment	
Robotics	10
Other Manufacturing Processes	

Knowledge Specialty	
Aero and Fluid Dynamics	
CAD, CAM, CIM	10
Finite Element Analysis	
Fuels and Lubricants	
Ergonomics and Industrial Design	
Joining and Fastening	
Materials: Ferrous Metals	10
Materials: Non-ferrous Metals	
Materials: Plastics	
Materials: Composites	
Materials: Rubber	
Materials: Glass	
Materials: Electrical/Electronic	
Finishes and Coatings	
Noise and Vibration	
Simulation and Modelling	
Stress/Strain/Stiffness	
Systems Integration	10
Other	

Automotive Component Specialty	
Body and Structure	10
Electrical System	
Engines	
Emission Controls	
Heating, Ventilation and A/C	
Instruments and Controls	
Interior Trim and Components	
Steering, Suspension, Brakes	10
Transmission	
Safety	
Wheels and Tires	
Diagnostic and Service Equipment	

Affiliations With Other Organizations
Stelco. ORTECH International.

R&D Projects
Bumper reinforcement and suspension components.

Special R&D Facilities
Specialize in 120 ksi ultra high strength low alloy steel with fully equipped tool and die facility at SKD's Amherstburg division. Fully staffed product engineering group at Windsor facility. Floor Space Devoted to R&D: 50 000 m^2.

Sambrook and Hermetz Industrial Designers

Unit D-9
116 Viceroy Road
CONCORD, Ont.
L4K 2M4

Date of Response: May 2, 1990
Contact: David Sambrook
Title: President
Phone: (416) 736-7619

Organization Type

Government Laboratory	
Technology Centre	
Community College	
University	
Industrial Company	
Other (including Consulting)	Yes

Total Staffing

1-24 Employees	Yes
25-99 Employees	
100-499 Employees	
500-999 Employees	
1 000+ Employees	
Total Staff	2

R&D Staffing

Doctorate Level	
Master's Level	
Bachelor's Level	
Technologists	
Total R&D Staff	

Type of R&D Performed

Research
Product Design
Manufacturing Processes
Industrial Engineering
Plant and Env. Hazards Eng.
Test and Evaluation

Vehicle Applicability

Alternate and Multifuel
Electric and Hybrid
Cars and Vans
Off-road Vehicles
Trucks, Buses, Trailers
Specialty Vehicles

Manufacturing Process Expertise

Metal Manufacturing Processes	5
Plastics Manufacturing Processes	5
Mfg. Machinery and Equipment	
Robotics	
Other Manufacturing Processes	

Knowledge Specialty

Aero and Fluid Dynamics	
CAD, CAM, CIM	5
Finite Element Analysis	
Fuels and Lubricants	
Ergonomics and Industrial Design	10
Joining and Fastening	
Materials: Ferrous Metals	5
Materials: Non-ferrous Metals	5
Materials: Plastics	5
Materials: Composites	
Materials: Rubber	
Materials: Glass	
Materials: Electrical/Electronic	
Finishes and Coatings	
Noise and Vibration	
Simulation and Modelling	5
Stress/Strain/Stiffness	
Systems Integration	
Other	

Automotive Component Specialty

Body and Structure	
Electrical System	
Engines	
Emission Controls	
Heating, Ventilation and A/C	
Instruments and Controls	5
Interior Trim and Components	
Steering, Suspension, Brakes	
Transmission	
Safety	
Wheels and Tires	
Diagnostic and Service Equipment	

Affiliations With Other Organizations

Association of Chartered Industrial Designers of Ontario (ACIDO).

R&D Projects

Automotive accessories.

Special R&D Facilities

Floor Space Devoted to R&D: Not Reported.

Sensor Adaptive Machines Inc. (SAMI)

6360 Hawthorne Drive
WINDSOR, Ont.
N8T 1J9

Date of Response: **July 11, 1990**
Contact: **Dr. Tim Pryor**
Title: **President**
Phone: **(519) 944-6641**
Fax: **(519) 945-1467**

Organization Type	
Government Laboratory	
Technology Centre	
Community College	
University	
Industrial Company	Yes
Other (including Consulting)	

Total Staffing	
1-24 Employees	Yes
25-99 Employees	
100-499 Employees	
500-999 Employees	
1 000+ Employees	
Total Staff	

R&D Staffing	
Doctorate Level	1
Master's Level	3
Bachelor's Level	6
Technologists	3
Total R&D Staff	8

Type of R&D Performed	
Research	
Product Design	
Manufacturing Processes	Yes
Industrial Engineering	
Plant and Env. Hazards Eng.	
Test and Evaluation	Yes

Vehicle Applicability	
Alternate and Multifuel	
Electric and Hybrid	
Cars and Vans	Yes
Off-road Vehicles	
Trucks, Buses, Trailers	
Specialty Vehicles	

Manufacturing Process Expertise	
Metal Manufacturing Processes	
Plastics Manufacturing Processes	
Mfg. Machinery and Equipment	8
Robotics	10
Other Manufacturing Processes	

Knowledge Specialty	
Aero and Fluid Dynamics	
CAD, CAM, CIM	10
Finite Element Analysis	
Fuels and Lubricants	
Ergonomics and Industrial Design	
Joining and Fastening	7
Materials: Ferrous Metals	10
Materials: Non-ferrous Metals	
Materials: Plastics	
Materials: Composites	
Materials: Rubber	
Materials: Glass	
Materials: Electrical/Electronic	
Finishes and Coatings	
Noise and Vibration	
Simulation and Modelling	
Stress/Strain/Stiffness	
Systems Integration	
Other	

Automotive Component Specialty	
Body and Structure	10
Electrical System	
Engines	7
Emission Controls	
Heating, Ventilation and A/C	
Instruments and Controls	
Interior Trim and Components	
Steering, Suspension, Brakes	8
Transmission	7
Safety	
Wheels and Tires	
Diagnostic and Service Equipment	

Affiliations With Other Organizations

Diffracto Limited.

R&D Projects

Intelligent machine tool development — Hughes, General Motors. Space station robotic vision contract with Canadian Space Agency. Miscellaneous machine vision inspection contracts. Robotic assembly system development — automotive.

Special R&D Facilities

Three machine vision laboratories. Floor Space Devoted to R&D: 600 m^2.

Siemens Automotive Ltd.
Induction/Cooling Division

540 Park Avenue East
CHATHAM, Ont.
N7M 5M7

Date of Response: July 24, 1990
Contact: Herbert N. Charles
Title: Manager, Engineering Services
Phone: (519) 436-3788
Fax: (519) 436-3836

Organization Type	
Government Laboratory	
Technology Centre	
Community College	
University	
Industrial Company	Yes
Other (including Consulting)	

Total Staffing	
1-24 Employees	
25-99 Employees	
100-499 Employees	
500-999 Employees	Yes
1 000+ Employees	
Total Staff	600

R&D Staffing	
Doctorate Level	
Master's Level	
Bachelor's Level	30
Technologists	
Total R&D Staff	75

Type of R&D Performed	
Research	
Product Design	Yes
Manufacturing Processes	
Industrial Engineering	
Plant and Env. Hazards Eng.	
Test and Evaluation	

Vehicle Applicability	
Alternate and Multifuel	
Electric and Hybrid	
Cars and Vans	Yes
Off-road Vehicles	
Trucks, Buses, Trailers	Yes
Specialty Vehicles	

Manufacturing Process Expertise	
Metal Manufacturing Processes	9
Plastics Manufacturing Processes	10
Mfg. Machinery and Equipment	
Robotics	
Other Manufacturing Processes	

Knowledge Specialty	
Aero and Fluid Dynamics	9
CAD, CAM, CIM	8
Finite Element Analysis	
Fuels and Lubricants	
Ergonomics and Industrial Design	
Joining and Fastening	
Materials: Ferrous Metals	
Materials: Non-ferrous Metals	
Materials: Plastics	
Materials: Composites	
Materials: Rubber	
Materials: Glass	
Materials: Electrical/Electronic	
Finishes and Coatings	
Noise and Vibration	9
Simulation and Modelling	9
Stress/Strain/Stiffness	10
Systems Integration	8
Other	

Automotive Component Specialty	
Body and Structure	
Electrical System	
Engines	
Emission Controls	
Heating, Ventilation and A/C	10
Instruments and Controls	
Interior Trim and Components	
Steering, Suspension, Brakes	
Transmission	
Safety	
Wheels and Tires	
Diagnostic and Service Equipment	

Affiliations With Other Organizations
Allied-Signal; Bendix.

R&D Projects
Design and development of Integrated Air/ Fuel System. Design and development of ducted cooling system.

Special R&D Facilities
State-of-the-art anechoic cooling tunnel. Air flow measurement facility. Environmental test facility (shaker). Acoustic simulation and attenuation facilities. Floor Space Devoted to R&D: 3 000 m^2.

Simon Fraser University
School of Engineering Science

BURNABY. B.C.
V5A 1S6

Date of Response: April 6, 1990
Contact: John Jones
Title: Professor
Phone: (604) 291-4679
Fax: (604) 291-4951

Organization Type

Government Laboratory	
Technology Centre	
Community College	
University	Yes
Industrial Company	
Other (including Consulting)	

Total Staffing

1-24 Employees	
25-99 Employees	
100-499 Employees	
500-999 Employees	
1 000+ Employees	Yes
Total Staff	

R&D Staffing

Doctorate Level	100
Master's Level	50
Bachelor's Level	100
Technologists	50
Total R&D Staff	300

Type of R&D Performed

Research	Yes
Product Design	
Manufacturing Processes	
Industrial Engineering	
Plant and Env. Hazards Eng.	
Test and Evaluation	

Vehicle Applicability

Alternate and Multifuel	Yes
Electric and Hybrid	
Cars and Vans	
Off-road Vehicles	
Trucks, Buses, Trailers	
Specialty Vehicles	

Manufacturing Process Expertise

Metal Manufacturing Processes	
Plastics Manufacturing Processes	
Mfg. Machinery and Equipment	
Robotics	
Other Manufacturing Processes	

Knowledge Specialty

Aero and Fluid Dynamics	
CAD, CAM, CIM	5
Finite Element Analysis	5
Fuels and Lubricants	
Ergonomics and Industrial Design	
Joining and Fastening	
Materials: Ferrous Metals	
Materials: Non-ferrous Metals	
Materials: Plastics	
Materials: Composites	
Materials: Rubber	
Materials: Glass	
Materials: Electrical/Electronic	
Finishes and Coatings	
Noise and Vibration	
Simulation and Modelling	5
Stress/Strain/Stiffness	
Systems Integration	
Other	

Automotive Component Specialty

Body and Structure	
Electrical System	
Engines	8
Emission Controls	
Heating, Ventilation and A/C	
Instruments and Controls	
Interior Trim and Components	
Steering, Suspension, Brakes	
Transmission	
Safety	
Wheels and Tires	
Diagnostic and Service Equipment	8

Affiliations With Other Organizations
None Reported.

R&D Projects
Design of expert system for engine diagnosis.

Special R&D Facilities
Floor Space Devoted to R&D: Not Reported.

Société de Microélectronique Industrielle de Sherbrooke Inc.

2500 Université
SHERBROOKE, Que.
J1K 2R1

Date of Response: July 16, 1990
Contact: Alain Boucher
Title: Director General
Phone: (819) 821-7620
Fax: (819) 821-7627

Organization Type

Government Laboratory	
Technology Centre	Yes
Community College	
University	
Industrial Company	
Other (including Consulting)	

Total Staffing

1-24 Employees	Yes
25-99 Employees	
100-499 Employees	
500-999 Employees	
1 000+ Employees	
Total Staff	18

R&D Staffing

Doctorate Level	
Master's Level	3
Bachelor's Level	7
Technologists	6
Total R&D Staff	15

Type of R&D Performed

Research	Yes
Product Design	Yes
Manufacturing Processes	Yes
Industrial Engineering	
Plant and Env. Hazards Eng.	
Test and Evaluation	Yes

Vehicle Applicability

Alternate and Multifuel	
Electric and Hybrid	
Cars and Vans	
Off-road Vehicles	
Trucks, Buses, Trailers	
Specialty Vehicles	

Manufacturing Process Expertise

Metal Manufacturing Processes	
Plastics Manufacturing Processes	
Mfg. Machinery and Equipment	
Robotics	
Other Manufacturing Processes	

Knowledge Specialty

Aero and Fluid Dynamics	
CAD, CAM, CIM	8
Finite Element Analysis	
Fuels and Lubricants	
Ergonomics and Industrial Design	
Joining and Fastening	
Materials: Ferrous Metals	
Materials: Non-ferrous Metals	
Materials: Plastics	
Materials: Composites	
Materials: Rubber	
Materials: Glass	
Materials: Electrical/Electronic	
Finishes and Coatings	
Noise and Vibration	
Simulation and Modelling	
Stress/Strain/Stiffness	
Systems Integration	
Other	

Automotive Component Specialty

Body and Structure	
Electrical System	8
Engines	
Emission Controls	
Heating, Ventilation and A/C	
Instruments and Controls	
Interior Trim and Components	
Steering, Suspension, Brakes	
Transmission	
Safety	
Wheels and Tires	
Diagnostic and Service Equipment	

Affiliations With Other Organizations

Hydro-Québec. Bell Canada. Northern Telecom. Les Industries C-MAC. Central Dynamics. Others.

R&D Projects

In the field of electronics or software, SMIS provides a complete solution suited to the client's product. From design to production, SMIS covers every aspect of product development.

Special R&D Facilities

CAD equipment with specialized software for printed circuit design, analog and digital simulators, MTBF prediction, and integrated circuit design. Software development based on CASE (Computer Aided Software Engineering). Design and manufacture of pre-production thick-film hybrid circuits, either wire-bonded or surface-mounted. Floor Space Devoted to R&D: 500 m^2.

Southern Alberta Institute of Technology
Auto-Diesel Department

1301 - 16 Avenue NW
CALGARY. Alta.
T2M 0L4

Date of Response: April 2, 1990
Contact: A. Blake Gordon
Title: Head
Phone: (403) 284-8471
Fax: (403) 284-7164

Organization Type	
Government Laboratory	
Technology Centre	
Community College	Yes
University	
Industrial Company	
Other (including Consulting)	

Total Staffing	
1-24 Employees	
25-99 Employees	
100-499 Employees	
500-999 Employees	Yes
1 000+ Employees	
Total Staff	634

R&D Staffing	
Doctorate Level	1
Master's Level	1
Bachelor's Level	5
Technologists	5
Total R&D Staff	

Type of R&D Performed	
Research	
Product Design	
Manufacturing Processes	
Industrial Engineering	
Plant and Env. Hazards Eng.	
Test and Evaluation	Yes

Vehicle Applicability	
Alternate and Multifuel	Yes
Electric and Hybrid	
Cars and Vans	Yes
Off-road Vehicles	
Trucks, Buses, Trailers	
Specialty Vehicles	

Manufacturing Process Expertise	
Metal Manufacturing Processes	6
Plastics Manufacturing Processes	2
Mfg. Machinery and Equipment	2
Robotics	3
Other Manufacturing Processes	

Knowledge Specialty	
Aero and Fluid Dynamics	5
CAD, CAM, CIM	7
Finite Element Analysis	2
Fuels and Lubricants	3
Ergonomics and Industrial Design	
Joining and Fastening	
Materials: Ferrous Metals	7
Materials: Non-ferrous Metals	7
Materials: Plastics	2
Materials: Composites	5
Materials: Rubber	
Materials: Glass	
Materials: Electrical/Electronic	2
Finishes and Coatings	3
Noise and Vibration	
Simulation and Modelling	1
Stress/Strain/Stiffness	
Systems Integration	
Other	

Automotive Component Specialty	
Body and Structure	
Electrical System	
Engines	3
Emission Controls	
Heating, Ventilation and A/C	4
Instruments and Controls	
Interior Trim and Components	
Steering, Suspension, Brakes	4
Transmission	4
Safety	
Wheels and Tires	
Diagnostic and Service Equipment	

Affiliations With Other Organizations
Alberta Society of Engineering Technologists. American Public Works Association. Federation of Automobile Dealers. Fleet Maintenance Association.

R&D Projects
Designed and built a prototype race car. Testing oil field pump jack. Emissions and performance testing.

Special R&D Facilities
SAIT provides facilities to industry. Floor Space Devoted to R&D: Not Reported.

Spectrum Engineering Corporation Ltd.

544 McDonnel Street
P.O. Box 687
PETERBOROUGH, Ont.
K9J 6Z8

Date of Response: March 21, 1990
Contact: H. Nicolas Weyman
Title: Business Development Manager
Phone: (705) 743-7520
Fax: (705) 743-9878

Organization Type	
Government Laboratory	
Technology Centre	
Community College	
University	
Industrial Company	
Other (including Consulting)	Yes

Total Staffing	
1-24 Employees	
25-99 Employees	Yes
100-499 Employees	
500-999 Employees	
1 000+ Employees	
Total Staff	

R&D Staffing	
Doctorate Level	1
Master's Level	3
Bachelor's Level	12
Technologists	7
Total R&D Staff	6

Type of R&D Performed	
Research	Yes
Product Design	Yes
Manufacturing Processes	
Industrial Engineering	
Plant and Env. Hazards Eng.	
Test and Evaluation	Yes

Vehicle Applicability	
Alternate and Multifuel	
Electric and Hybrid	
Cars and Vans	
Off-road Vehicles	
Trucks, Buses, Trailers	
Specialty Vehicles	Yes

Manufacturing Process Expertise	
Metal Manufacturing Processes	1
Plastics Manufacturing Processes	5
Mfg. Machinery and Equipment	3
Robotics	6
Other Manufacturing Processes	

Knowledge Specialty	
Aero and Fluid Dynamics	4
CAD, CAM, CIM	6
Finite Element Analysis	7
Fuels and Lubricants	2
Ergonomics and Industrial Design	1
Joining and Fastening	1
Materials: Ferrous Metals	2
Materials: Non-ferrous Metals	2
Materials: Plastics	5
Materials: Composites	3
Materials: Rubber	3
Materials: Glass	1
Materials: Electrical/Electronic	5
Finishes and Coatings	2
Noise and Vibration	6
Simulation and Modelling	4
Stress/Strain/Stiffness	7
Systems Integration	2
Other	

Automotive Component Specialty	
Body and Structure	1
Electrical System	3
Engines	4
Emission Controls	1
Heating, Ventilation and A/C	7
Instruments and Controls	6
Interior Trim and Components	1
Steering, Suspension, Brakes	2
Transmission	3
Safety	2
Wheels and Tires	1
Diagnostic and Service Equipment	3

Affiliations With Other Organizations

None Reported.

R&D Projects

Automatic brazing station for connector manufacture. Automatic work station for remote servicing of cables. Remotely operated special tooling for cutting, cleaning, welding. Cable assembly production system. Cable guidance mechanisms.

Special R&D Facilities

Cable assembly production system for testing and assembly of variable depth sonar and other cables. Tensile test equipment. Electronics lab. NISA II finite element analysis software program. Floor Space Devoted to R&D: 400 m^2.

Stelco Inc.

1375 Kerns Road
BURLINGTON, Ont.
L7P 3H8

Date of Response: April 4, 1990
Contact: D.B. McCutcheon
Title: Director, Research and Development
Phone: (416) 528-2511
Fax: (416) 332-9067

Organization Type

Government Laboratory	
Technology Centre	
Community College	
University	
Industrial Company	Yes
Other (including Consulting)	

Total Staffing

1-24 Employees	
25-99 Employees	
100-499 Employees	Yes
500-999 Employees	
1 000+ Employees	
Total Staff	287

R&D Staffing

Doctorate Level	4
Master's Level	20
Bachelor's Level	35
Technologists	46
Total R&D Staff	136

Type of R&D Performed

Research	Yes
Product Design	Yes
Manufacturing Processes	Yes
Industrial Engineering	
Plant and Env. Hazards Eng.	Yes
Test and Evaluation	Yes

Vehicle Applicability

- Alternate and Multifuel
- Electric and Hybrid
- Cars and Vans
- Off-road Vehicles
- Trucks, Buses, Trailers
- Specialty Vehicles

Manufacturing Process Expertise

Metal Manufacturing Processes	7
Plastics Manufacturing Processes	3
Mfg. Machinery and Equipment	3
Robotics	3
Other Manufacturing Processes	

Knowledge Specialty

Aero and Fluid Dynamics	2
CAD, CAM, CIM	6
Finite Element Analysis	6
Fuels and Lubricants	1
Ergonomics and Industrial Design	2
Joining and Fastening	8
Materials: Ferrous Metals	9
Materials: Non-ferrous Metals	1
Materials: Plastics	4
Materials: Composites	2
Materials: Rubber	
Materials: Glass	
Materials: Electrical/Electronic	
Finishes and Coatings	4
Noise and Vibration	3
Simulation and Modelling	2
Stress/Strain/Stiffness	4
Systems Integration	1
Other	

Automotive Component Specialty

- Body and Structure
- Electrical System
- Engines
- Emission Controls
- Heating, Ventilation and A/C
- Instruments and Controls
- Interior Trim and Components
- Steering, Suspension, Brakes
- Transmission
- Safety
- Wheels and Tires
- Diagnostic and Service Equipment

Affiliations With Other Organizations

SAE, ASM, CIM, TWI, EWI, Colorado School of Mines, AISI, Canadian Plastics Institute, CAIMIF.

R&D Projects

Leaf springs, coil springs, forgings, fasteners, wheels, body panels.

Special R&D Facilities

Metallographic fatigue and tensile machine. Electron microscopes. CAD/CAM system. CNC centre — machining, limiting dome-height machine (stretching steel). Image processing system. Photography. Floor Space Devoted to R&D: 1 750 m^2.

TAVA Corporation

1761 Oxford Street East
LONDON, Ont.
N5V 2Z6

Date of Response: July 11, 1990
Contact: Brian McIlhargey
Title: President
Phone: (519) 455-0154
Fax: (519) 453-6288

Organization Type		**Total Staffing**		**R&D Staffing**	
Government Laboratory		1-24 Employees	Yes	Doctorate Level	
Technology Centre		25-99 Employees		Master's Level	2
Community College		100-499 Employees		Bachelor's Level	2
University		500-999 Employees		Technologists	1
Industrial Company		1 000+ Employees		Total R&D Staff	5
Other (including Consulting)	Yes	Total Staff	5		

Type of R&D Performed		**Vehicle Applicability**		**Manufacturing Process Expertise**	
Research		Alternate and Multifuel		Metal Manufacturing Processes	
Product Design		Electric and Hybrid		Plastics Manufacturing Processes	
Manufacturing Processes		Cars and Vans		Mfg. Machinery and Equipment	
Industrial Engineering		Off-road Vehicles		Robotics	
Plant and Env. Hazards Eng.		Trucks, Buses, Trailers		Other Manufacturing Processes	
Test and Evaluation	Yes	Specialty Vehicles			

Knowledge Specialty				**Automotive Component Specialty**	
Aero and Fluid Dynamics		Finishes and Coatings	9	Body and Structure	
CAD, CAM, CIM	10	Noise and Vibration		Electrical System	
Finite Element Analysis		Simulation and Modelling		Engines	
Fuels and Lubricants		Stress/Strain/Stiffness		Emission Controls	
Ergonomics and Industrial Design		Systems Integration		Heating, Ventilation and A/C	
Joining and Fastening		Other	10	Instruments and Controls	
Materials: Ferrous Metals				Interior Trim and Components	
Materials: Non-ferrous Metals				Steering, Suspension, Brakes	
Materials: Plastics				Transmission	
Materials: Composites				Safety	
Materials: Rubber				Wheels and Tires	
Materials: Glass				Diagnostic and Service Equipment	
Materials: Electrical/Electronic					

Affiliations With Other Organizations

General Motors, BASF, University of Guelph, University of Western Ontario, and others.

R&D Projects

Elimination or emulation of holding fixtures for co-ordinate measuring machine checking of parts to CAD-generated data. Non-contact film thickness measurement on any substrate including plastics. Micro surface roughness analysis of painted surfaces (non-destructive).

Special R&D Facilities

Nuclear spectrometry equipment. Floor Space Devoted to R&D: 350 m^2.

TES Limited

308 Legget Drive
KANATA, Ont.
K2K 1Y6

Date of Response: April 11, 1990
Contact: Edward A. Sloot
Title: Marketing Manager
Phone: (613) 592-2998
Fax: (613) 592-6893

Organization Type

Government Laboratory	
Technology Centre	
Community College	
University	
Industrial Company	Yes
Other (including Consulting)	

Total Staffing

1-24 Employees	
25-99 Employees	Yes
100-499 Employees	
500-999 Employees	
1 000+ Employees	
Total Staff	

R&D Staffing

Doctorate Level	
Master's Level	
Bachelor's Level	10
Technologists	2
Total R&D Staff	12

Type of R&D Performed

Research	Yes
Product Design	Yes
Manufacturing Processes	
Industrial Engineering	
Plant and Env. Hazards Eng.	
Test and Evaluation	Yes

Vehicle Applicability

Alternate and Multifuel	Yes
Electric and Hybrid	Yes
Cars and Vans	Yes
Off-road Vehicles	Yes
Trucks, Buses, Trailers	Yes
Specialty Vehicles	Yes

Manufacturing Process Expertise

Metal Manufacturing Processes	
Plastics Manufacturing Processes	
Mfg. Machinery and Equipment	
Robotics	
Other Manufacturing Processes	

Knowledge Specialty

Aero and Fluid Dynamics	4
CAD, CAM, CIM	6
Finite Element Analysis	6
Fuels and Lubricants	2
Ergonomics and Industrial Design	4
Joining and Fastening	5
Materials: Ferrous Metals	8
Materials: Non-ferrous Metals	8
Materials: Plastics	6
Materials: Composites	3
Materials: Rubber	3
Materials: Glass	2
Materials: Electrical/Electronic	8
Finishes and Coatings	3
Noise and Vibration	6
Simulation and Modelling	8
Stress/Strain/Stiffness	10
Systems Integration	10
Other	

Automotive Component Specialty

Body and Structure	3
Electrical System	10
Engines	3
Emission Controls	3
Heating, Ventilation and A/C	2
Instruments and Controls	10
Interior Trim and Components	2
Steering, Suspension, Brakes	3
Transmission	3
Safety	8
Wheels and Tires	2
Diagnostic and Service Equipment	2

Affiliations With Other Organizations

Computing Devices Company, Thomson-CSF Systems Canada, MREL (teaming agreements). TESCAR, Fleetrak (joint ventures).

R&D Projects

Anti-jacknife system (development and evaluation). MILE demonstration program. Joystick steering system evaluation. Wheelchair tiedown/interface development. ISO shelter mobilizer development. Leopard tank wiper arm development. Transect/NATO reference mobility model (NRMM) validation.

Special R&D Facilities

Dynamic/static hydraulic testing apparatus. Floor Space Devoted to R&D: 1 000 m^2.

Technical University of Nova Scotia
Department of Mechanical Engineering

5269 Morris Street
HALIFAX, N.S.
B3J 2X4

Date of Response: July 6, 1990
Contact: Professor Leslie T. Russell, PhD, P.Eng.
Title: Head
Phone: (902) 420-7631
Fax: (902) 423-6711

Organization Type	
Government Laboratory	
Technology Centre	
Community College	
University	Yes
Industrial Company	
Other (including Consulting)	

Total Staffing	
1-24 Employees	
25-99 Employees	
100-499 Employees	Yes
500-999 Employees	
1 000+ Employees	
Total Staff	

R&D Staffing	
Doctorate Level	15
Master's Level	3
Bachelor's Level	
Technologists	5
Total R&D Staff	23

Type of R&D Performed	
Research	
Product Design	
Manufacturing Processes	Yes
Industrial Engineering	
Plant and Env. Hazards Eng.	
Test and Evaluation	

Vehicle Applicability

- Alternate and Multifuel
- Electric and Hybrid
- Cars and Vans
- Off-road Vehicles
- Trucks, Buses, Trailers
- Specialty Vehicles

Manufacturing Process Expertise

- Metal Manufacturing Processes
- Plastics Manufacturing Processes
- Mfg. Machinery and Equipment
- Robotics
- Other Manufacturing Processes

Knowledge Specialty	
Aero and Fluid Dynamics	8
CAD, CAM, CIM	8
Finite Element Analysis	8
Fuels and Lubricants	8
Ergonomics and Industrial Design	
Joining and Fastening	
Materials: Ferrous Metals	
Materials: Non-ferrous Metals	
Materials: Plastics	
Materials: Composites	10
Materials: Rubber	
Materials: Glass	
Materials: Electrical/Electronic	
Finishes and Coatings	
Noise and Vibration	8
Simulation and Modelling	
Stress/Strain/Stiffness	10
Systems Integration	
Other	

Automotive Component Specialty	
Body and Structure	
Electrical System	
Engines	8
Emission Controls	8
Heating, Ventilation and A/C	8
Instruments and Controls	
Interior Trim and Components	
Steering, Suspension, Brakes	
Transmission	
Safety	
Wheels and Tires	
Diagnostic and Service Equipment	

Affiliations With Other Organizations

Close collaboration with Advanced Materials Engineering Centre (AMEC) on composite materials, Nova Scotia Research Foundation and other local research institutions.

R&D Projects

A wide range of projects is currently being conducted in the department, including projects on heat pumps, coal utilization and environmental controls. Other consulting contracts with private companies. Although there are no significant research projects directly related to the automotive industry, the infrastructure is ready, and the staff is interested.

Special R&D Facilities

Internal combustion engine lab with several dynamometers; computerized data acquisition; gasoline, diesel, CFR engines, exhaust gas analyzers; vibrations lab using holography for remote sensing; CAD/CAM facilities; computer centre with mainframes; computational fluid mechanics. Finite element capability with ANSYS, ALGOR, etc.; research facilities at AMEC for composite materials. Floor Space Devoted to R&D: 500 m^2.

The University of British Columbia
Department of Electrical Engineering

2075 Wesbrook Mall
VANCOUVER, B.C.
V6T 1W5

Date of Response: May 21, 1990
Contact: W.G. Dunford
Title: Assistant Professor
Phone: (604) 228-6660
Fax: (604) 228-5949

Organization Type

Government Laboratory	
Technology Centre	
Community College	
University	Yes
Industrial Company	
Other (including Consulting)	

Total Staffing

1-24 Employees	
25-99 Employees	Yes
100-499 Employees	
500-999 Employees	
1 000+ Employees	
Total Staff	48

R&D Staffing

Doctorate Level	30
Master's Level	4
Bachelor's Level	3
Technologists	8
Total R&D Staff	45

Type of R&D Performed

- Research
- Product Design
- Manufacturing Processes
- Industrial Engineering
- Plant and Env. Hazards Eng.
- Test and Evaluation

Vehicle Applicability

Alternate and Multifuel	
Electric and Hybrid	Yes
Cars and Vans	
Off-road Vehicles	
Trucks, Buses, Trailers	
Specialty Vehicles	Yes

Manufacturing Process Expertise

- Metal Manufacturing Processes
- Plastics Manufacturing Processes
- Mfg. Machinery and Equipment
- Robotics
- Other Manufacturing Processes

Knowledge Specialty

- Aero and Fluid Dynamics
- CAD, CAM, CIM
- Finite Element Analysis
- Fuels and Lubricants
- Ergonomics and Industrial Design
- Joining and Fastening
- Materials: Ferrous Metals
- Materials: Non-ferrous Metals
- Materials: Plastics
- Materials: Composites
- Materials: Rubber
- Materials: Glass
- Materials: Electrical/Electronic
- Finishes and Coatings
- Noise and Vibration
- Simulation and Modelling
- Stress/Strain/Stiffness
- Systems Integration
- Other

Automotive Component Specialty

Body and Structure	
Electrical System	8
Engines	
Emission Controls	
Heating, Ventilation and A/C	
Instruments and Controls	8
Interior Trim and Components	
Steering, Suspension, Brakes	
Transmission	
Safety	
Wheels and Tires	
Diagnostic and Service Equipment	

Affiliations With Other Organizations

None Reported.

R&D Projects

Battery-powered mining locomotive using bipolar transistor inverter and squirrel cage induction motor. This uses the Intel 8096 for control.

Special R&D Facilities

Power converter development laboratory. Printed circuit board design facilities. Microprocessor development facilities. Floor Space Devoted to R&D: Not Reported.

The University of British Columbia
Department of Mechanical Engineering

2075 Wesbrook Mall
VANCOUVER, B.C.
V6T 1W5

Date of Response: April 20, 1990
Contact: Dr. R.L. Evans
Title: Professor
Phone: (604) 228-6614
Fax: (604) 228-2403

Organization Type	
Government Laboratory	
Technology Centre	
Community College	
University	Yes
Industrial Company	
Other (including Consulting)	

Total Staffing	
1-24 Employees	Yes
25-99 Employees	
100-499 Employees	
500-999 Employees	
1 000+ Employees	
Total Staff	6

R&D Staffing	
Doctorate Level	3
Master's Level	3
Bachelor's Level	
Technologists	
Total R&D Staff	10

Type of R&D Performed	
Research	Yes
Product Design	
Manufacturing Processes	
Industrial Engineering	
Plant and Env. Hazards Eng.	
Test and Evaluation	Yes

Vehicle Applicability	
Alternate and Multifuel	Yes
Electric and Hybrid	
Cars and Vans	Yes
Off-road Vehicles	
Trucks, Buses, Trailers	Yes
Specialty Vehicles	

Manufacturing Process Expertise	
Metal Manufacturing Processes	
Plastics Manufacturing Processes	
Mfg. Machinery and Equipment	
Robotics	
Other Manufacturing Processes	

Knowledge Specialty	
Aero and Fluid Dynamics	9
CAD, CAM, CIM	
Finite Element Analysis	
Fuels and Lubricants	9
Ergonomics and Industrial Design	
Joining and Fastening	
Materials: Ferrous Metals	
Materials: Non-ferrous Metals	
Materials: Plastics	
Materials: Composites	
Materials: Rubber	
Materials: Glass	
Materials: Electrical/Electronic	
Finishes and Coatings	
Noise and Vibration	
Simulation and Modelling	7
Stress/Strain/Stiffness	
Systems Integration	
Other	

Automotive Component Specialty	
Body and Structure	
Electrical System	
Engines	9
Emission Controls	7
Heating, Ventilation and A/C	
Instruments and Controls	
Interior Trim and Components	
Steering, Suspension, Brakes	
Transmission	
Safety	
Wheels and Tires	
Diagnostic and Service Equipment	

Affiliations With Other Organizations
None Reported.

R&D Projects
Fast-burn combustion chamber development. Direct injection of natural gas in diesel engines. Turbulent flame propagation. Fundamental studies of turbulence generation in combustion engines.

Special R&D Facilities
Ricardo Hydra single-cylinder research engine with computer data acquisition, emissions bench, etc. Detroit Diesel single-cylinder engine. Caterpillar four-cylinder engine. Specialized combustion bombs and tunnel. Floor Space Devoted To R&D: 30 m^2.

The University of Western Ontario

Surface Science Western

Room 6
Natural Sciences Centre
LONDON, Ont.
N6A 5B7

Date of Response: March 22, 1990
Contact: Mr. R.D. Davidson
Title: Manager, Scientific Operations
Phone: (519) 661-2173
Fax: (519) 661-3486

Organization Type	
Government Laboratory	
Technology Centre	
Community College	
University	Yes
Industrial Company	
Other (including Consulting)	

Total Staffing	
1-24 Employees	Yes
25-99 Employees	
100-499 Employees	
500-999 Employees	
1 000+ Employees	
Total Staff	15

R&D Staffing	
Doctorate Level	5
Master's Level	
Bachelor's Level	5
Technologists	5
Total R&D Staff	15

Type of R&D Performed	
Research	Yes
Product Design	
Manufacturing Processes	
Industrial Engineering	
Plant and Env. Hazards Eng.	
Test and Evaluation	Yes

Vehicle Applicability	
Alternate and Multifuel	Yes
Electric and Hybrid	Yes
Cars and Vans	Yes
Off-road Vehicles	Yes
Trucks, Buses, Trailers	Yes
Specialty Vehicles	Yes

Manufacturing Process Expertise	
Metal Manufacturing Processes	
Plastics Manufacturing Processes	
Mfg. Machinery and Equipment	
Robotics	
Other Manufacturing Processes	

Knowledge Specialty	
Aero and Fluid Dynamics	
CAD, CAM, CIM	
Finite Element Analysis	
Fuels and Lubricants	
Ergonomics and Industrial Design	
Joining and Fastening	
Materials: Ferrous Metals	5
Materials: Non-ferrous Metals	5
Materials: Plastics	
Materials: Composites	6
Materials: Rubber	
Materials: Glass	6
Materials: Electrical/Electronic	
Finishes and Coatings	10
Noise and Vibration	
Simulation and Modelling	
Stress/Strain/Stiffness	
Systems Integration	
Other	

Automotive Component Specialty	
Body and Structure	8
Electrical System	5
Engines	
Emission Controls	
Heating, Ventilation and A/C	
Instruments and Controls	
Interior Trim and Components	
Steering, Suspension, Brakes	
Transmission	
Safety	
Wheels and Tires	
Diagnostic and Service Equipment	

Affiliations With Other Organizations

None Reported.

R&D Projects

Improved methods for detecting defects in automotive paints. Cleaning and preparation of metal surfaces prior to organic coating.

Special R&D Facilities

Scanning electron microscopy with energy dispersive X-ray (SEM/EDX). Image analysis. Electrochemical corrosion test equipment, AC impedance and scanning micro-electrodes. X-ray photoelectron spectroscopy (XPS). Surface cleaning facilities (plasma and UV/ozone). Scanning auger microscopy (SAM) and secondary ion mass spectroscopy (SIMS). Floor Space Devoted to R&D: 250 m^2.

Thermotech Engineering

1064 Gardiners Road
KINGSTON, Ont.
K7P 1K2

Date of Response: June 15, 1990
Contact: Dr. M.F. Bardon
Title: President
Phone: (613) 541-0358
Fax: (613) 384-6009

Organization Type		**Total Staffing**		**R&D Staffing**	
Government Laboratory		1-24 Employees	Yes	Doctorate Level	2
Technology Centre		25-99 Employees		Master's Level	
Community College		100-499 Employees		Bachelor's Level	1
University		500-999 Employees		Technologists	4
Industrial Company		1 000+ Employees		Total R&D Staff	9
Other (including Consulting)	Yes	Total Staff	9		

Type of R&D Performed		**Vehicle Applicability**		**Manufacturing Process Expertise**	
Research	Yes	Alternate and Multifuel	Yes	Metal Manufacturing Processes	
Product Design		Electric and Hybrid		Plastics Manufacturing Processes	
Manufacturing Processes		Cars and Vans	Yes	Mfg. Machinery and Equipment	
Industrial Engineering		Off-road Vehicles		Robotics	
Plant and Env. Hazards Eng.		Trucks, Buses, Trailers		Other Manufacturing Processes	
Test and Evaluation	Yes	Specialty Vehicles			

Knowledge Specialty				**Automotive Component Specialty**	
Aero and Fluid Dynamics		Finishes and Coatings		Body and Structure	
CAD, CAM, CIM		Noise and Vibration		Electrical System	
Finite Element Analysis		Simulation and Modelling		Engines	10
Fuels and Lubricants	8	Stress/Strain/Stiffness		Emission Controls	8
Ergonomics and Industrial Design		Systems Integration		Heating, Ventilation and A/C	
Joining and Fastening		Other		Instruments and Controls	
Materials: Ferrous Metals				Interior Trim and Components	
Materials: Non-ferrous Metals				Steering, Suspension, Brakes	
Materials: Plastics				Transmission	
Materials: Composites				Safety	
Materials: Rubber				Wheels and Tires	
Materials: Glass				Diagnostic and Service Equipment	
Materials: Electrical/Electronic					

Affiliations With Other Organizations

Work conducted in collaboration with Department of Mechanical Engineering, Royal Military College, Kingston.

R&D Projects

Performance of methanol fuel blends. Cold starting. Fuel economy and exhaust emissions of alternative fuels. Fuel volatility characterization.

Special R&D Facilities

Chassis dynamometer. Engine dynamometers. Single-cylinder research engines. Exhaust emissions measurement. Fuel property tests. Fast data acquisition system. Combustion modelling. Floor Space Devoted to R&D: 50 m^2.

Transport Canada
Motor Vehicle Test Centre

P.O. Box 285
BLAINVILLE, Que.
J7E 4J2

Date of Response: March 20, 1990
Contact: J. Robert Galarneau
Title: Director
Phone: (514) 430-7981
Fax: (514) 430-2318

Organization Type	
Government Laboratory	Yes
Technology Centre	
Community College	
University	
Industrial Company	
Other (including Consulting)	

Total Staffing	
1-24 Employees	
25-99 Employees	Yes
100-499 Employees	
500-999 Employees	
1 000+ Employees	
Total Staff	

R&D Staffing	
Doctorate Level	
Master's Level	1
Bachelor's Level	6
Technologists	15
Total R&D Staff	

Type of R&D Performed	
Research	
Product Design	
Manufacturing Processes	
Industrial Engineering	
Plant and Env. Hazards Eng.	
Test and Evaluation	Yes

Vehicle Applicability	
Alternate and Multifuel	Yes
Electric and Hybrid	Yes
Cars and Vans	Yes
Off-road Vehicles	Yes
Trucks, Buses, Trailers	Yes
Specialty Vehicles	Yes

Manufacturing Process Expertise	
Metal Manufacturing Processes	
Plastics Manufacturing Processes	
Mfg. Machinery and Equipment	
Robotics	
Other Manufacturing Processes	

Knowledge Specialty

Aero and Fluid Dynamics
CAD, CAM, CIM
Finite Element Analysis
Fuels and Lubricants
Ergonomics and Industrial Design
Joining and Fastening
Materials: Ferrous Metals
Materials: Non-ferrous Metals
Materials: Plastics
Materials: Composites
Materials: Rubber
Materials: Glass
Materials: Electrical/Electronic
Finishes and Coatings
Noise and Vibration
Simulation and Modelling
Stress/Strain/Stiffness
Systems Integration
Other

Automotive Component Specialty	
Body and Structure	10
Electrical System	
Engines	3
Emission Controls	3
Heating, Ventilation and A/C	
Instruments and Controls	2
Interior Trim and Components	
Steering, Suspension, Brakes	7
Transmission	
Safety	10
Wheels and Tires	2
Diagnostic and Service Equipment	

Affiliations With Other Organizations

None Reported.

R&D Projects

Transport Canada: CMVSS test programs, standards development test programs, alternate fuels test programs.

Special R&D Facilities

Canadian Motor Vehicle Safety Standards (CMVSS). Test equipment and facilities plus instrumentation and calibration equipment.
Floor Space Devoted to R&D: Not Reported.

Uniroyal Goodrich

149 Strange Street
KITCHENER, Ont.
N2G 4S5

Date of Response: May 1, 1990
Contact: Thomas L. Powell
Title: Technical Director
Phone: (519) 749-4722
Fax: (519) 749-4600

Organization Type

Government Laboratory	
Technology Centre	
Community College	
University	
Industrial Company	Yes
Other (including Consulting)	

Total Staffing

1-24 Employees	
25-99 Employees	
100-499 Employees	
500-999 Employees	
1 000+ Employees	Yes
Total Staff	2 850

R&D Staffing

Doctorate Level	1
Master's Level	
Bachelor's Level	7
Technologists	9
Total R&D Staff	27

Type of R&D Performed

Research	
Product Design	Yes
Manufacturing Processes	Yes
Industrial Engineering	
Plant and Env. Hazards Eng.	Yes
Test and Evaluation	Yes

Vehicle Applicability

Alternate and Multifuel	
Electric and Hybrid	
Cars and Vans	Yes
Off-road Vehicles	
Trucks, Buses, Trailers	
Specialty Vehicles	

Manufacturing Process Expertise

Metal Manufacturing Processes	4
Plastics Manufacturing Processes	
Mfg. Machinery and Equipment	10
Robotics	6
Other Manufacturing Processes	3

Knowledge Specialty

Aero and Fluid Dynamics	
CAD, CAM, CIM	5
Finite Element Analysis	
Fuels and Lubricants	
Ergonomics and Industrial Design	
Joining and Fastening	5
Materials: Ferrous Metals	5
Materials: Non-ferrous Metals	2
Materials: Plastics	
Materials: Composites	2
Materials: Rubber	10
Materials: Glass	
Materials: Electrical/Electronic	
Finishes and Coatings	
Noise and Vibration	8
Simulation and Modelling	
Stress/Strain/Stiffness	5
Systems Integration	
Other	

Automotive Component Specialty

Body and Structure	
Electrical System	
Engines	
Emission Controls	
Heating, Ventilation and A/C	
Instruments and Controls	
Interior Trim and Components	
Steering, Suspension, Brakes	
Transmission	
Safety	
Wheels and Tires	10
Diagnostic and Service Equipment	

Affiliations With Other Organizations

None Reported.

R&D Projects

Tire design and processing. Machinery and equipment for tire manufacturing.

Special R&D Facilities

Floor Space Devoted to R&D: Not Reported.

Université Laval
CERSIM

Pavillon Alexandre-Vachon
Cité universitaire
QUEBEC CITY, Que.
G1K 7P4

Date of Response: July 11, 1990
Contact: Robert E. Prud'homme
Title: Director
Phone: (418) 656-3683
Fax: (418) 656-5902

Organization Type	
Government Laboratory	
Technology Centre	
Community College	
University	Yes
Industrial Company	
Other (including Consulting)	

Total Staffing	
1-24 Employees	
25-99 Employees	Yes
100-499 Employees	
500-999 Employees	
1 000+ Employees	
Total Staff	67

R&D Staffing	
Doctorate Level	17
Master's Level	25
Bachelor's Level	25
Technologists	
Total R&D Staff	67

Type of R&D Performed	
Research	Yes
Product Design	
Manufacturing Processes	
Industrial Engineering	Yes
Plant and Env. Hazards Eng.	
Test and Evaluation	Yes

Vehicle Applicability	
Alternate and Multifuel	
Electric and Hybrid	
Cars and Vans	
Off-road Vehicles	
Trucks, Buses, Trailers	
Specialty Vehicles	

Manufacturing Process Expertise	
Metal Manufacturing Processes	
Plastics Manufacturing Processes	10
Mfg. Machinery and Equipment	
Robotics	
Other Manufacturing Processes	

Knowledge Specialty	
Aero and Fluid Dynamics	
CAD, CAM, CIM	10
Finite Element Analysis	10
Fuels and Lubricants	
Ergonomics and Industrial Design	
Joining and Fastening	
Materials: Ferrous Metals	
Materials: Non-ferrous Metals	
Materials: Plastics	10
Materials: Composites	10
Materials: Rubber	
Materials: Glass	
Materials: Electrical/Electronic	
Finishes and Coatings	
Noise and Vibration	
Simulation and Modelling	
Stress/Strain/Stiffness	
Systems Integration	
Other	

Automotive Component Specialty	
Body and Structure	
Electrical System	
Engines	
Emission Controls	
Heating, Ventilation and A/C	
Instruments and Controls	
Interior Trim and Components	
Steering, Suspension, Brakes	
Transmission	
Safety	
Wheels and Tires	
Diagnostic and Service Equipment	

Affiliations With Other Organizations
None Reported.

R&D Projects
The various ongoing projects fall into three main subject areas: alloys and composites; macromolecules of biological and vegetational interest; orientation.

Special R&D Facilities
Note: Full name of the organization is Centre de recherche en sciences et ingénierie des macromolécules. CERSIM has various specialized equipment applicable to polymers: equipment for characterization in a solution or a solid state; for engineering; for spectroscopy. Floor Space Devoted to R&D: Not Reported.

Université Laval
Department of Mechanical Engineering

Cité universitaire
QUEBEC CITY, Que.
G1K 7P4

Date of Response: **June 4, 1990**
Contact: **Dr. Alain Cardou**
Title: **Professor**
Phone: **(418) 656-7727**
Fax: **(418) 656-5902**

Organization Type

Government Laboratory	
Technology Centre	
Community College	
University	Yes
Industrial Company	
Other (including Consulting)	

Total Staffing

1-24 Employees	
25-99 Employees	Yes
100-499 Employees	
500-999 Employees	
1 000+ Employees	
Total Staff	

R&D Staffing

Doctorate Level	6
Master's Level	12
Bachelor's Level	15
Technologists	1
Total R&D Staff	35

Type of R&D Performed

Research	Yes
Product Design	
Manufacturing Processes	
Industrial Engineering	
Plant and Env. Hazards Eng.	
Test and Evaluation	Yes

Vehicle Applicability

Alternate and Multifuel	
Electric and Hybrid	
Cars and Vans	
Off-road Vehicles	
Trucks, Buses, Trailers	Yes
Specialty Vehicles	

Manufacturing Process Expertise

Metal Manufacturing Processes	
Plastics Manufacturing Processes	
Mfg. Machinery and Equipment	
Robotics	
Other Manufacturing Processes	

Knowledge Specialty

Aero and Fluid Dynamics	5
CAD, CAM, CIM	10
Finite Element Analysis	10
Fuels and Lubricants	
Ergonomics and Industrial Design	
Joining and Fastening	
Materials: Ferrous Metals	
Materials: Non-ferrous Metals	
Materials: Plastics	
Materials: Composites	
Materials: Rubber	
Materials: Glass	
Materials: Electrical/Electronic	
Finishes and Coatings	
Noise and Vibration	
Simulation and Modelling	10
Stress/Strain/Stiffness	8
Systems Integration	
Other	

Automotive Component Specialty

Body and Structure	
Electrical System	
Engines	
Emission Controls	
Heating, Ventilation and A/C	
Instruments and Controls	
Interior Trim and Components	
Steering, Suspension, Brakes	8
Transmission	10
Safety	
Wheels and Tires	
Diagnostic and Service Equipment	

Affiliations With Other Organizations

National Research Council of Canada. Hydro-Québec.

R&D Projects

Various projects on gears, gear systems and suspensions of heavy vehicles.

Special R&D Facilities

Laboratory for testing gear systems. CAD/CAM systems. Metrology laboratory. Floor Space Devoted to R&D: Not Reported.

Université Laval
LIPAO, Department of Chemical Engineering

QUEBEC CITY, Que.	**Date of Response:**	**May 21, 1990**	
G1K 7P4	**Contact:**	**Dr. P.A. Tanguy**	
	Title:	**Professor**	
	Phone:	**(418) 656-3565**	
	Fax:	**(418) 656-5993**	

Organization Type		**Total Staffing**		**R&D Staffing**	
Government Laboratory		1-24 Employees	Yes	Doctorate Level	
Technology Centre		25-99 Employees		Master's Level	
Community College		100-499 Employees		Bachelor's Level	
University	Yes	500-999 Employees		Technologists	
Industrial Company		1 000+ Employees		Total R&D Staff	
Other (including Consulting)		Total Staff			

Type of R&D Performed		**Vehicle Applicability**		**Manufacturing Process Expertise**	
Research	Yes	Alternate and Multifuel	Yes	Metal Manufacturing Processes	
Product Design		Electric and Hybrid	Yes	Plastics Manufacturing Processes	8
Manufacturing Processes	Yes	Cars and Vans	Yes	Mfg. Machinery and Equipment	
Industrial Engineering		Off-road Vehicles	Yes	Robotics	
Plant and Env. Hazards Eng.		Trucks, Buses, Trailers	Yes	Other Manufacturing Processes	
Test and Evaluation		Specialty Vehicles	Yes		

Knowledge Specialty				**Automotive Component Specialty**
Aero and Fluid Dynamics	10	Finishes and Coatings		Body and Structure
CAD, CAM, CIM		Noise and Vibration		Electrical System
Finite Element Analysis	10	Simulation and Modelling	10	Engines
Fuels and Lubricants		Stress/Strain/Stiffness		Emission Controls
Ergonomics and Industrial Design		Systems Integration		Heating, Ventilation and A/C
Joining and Fastening		Other		Instruments and Controls
Materials: Ferrous Metals				Interior Trim and Components
Materials: Non-ferrous Metals				Steering, Suspension, Brakes
Materials: Plastics	8			Transmission
Materials: Composites	6			Safety
Materials: Rubber	6			Wheels and Tires
Materials: Glass				Diagnostic and Service Equipment
Materials: Electrical/Electronic				

Affiliations With Other Organizations
None Reported.

R&D Projects
None Reported.

Special R&D Facilities
Network of CAD workstations (Apollo, Silicon Graphics). 3-D modelling software for injection moulding and extrusion. Floor Space Devoted to R&D: 120 m^2.

Université de Sherbrooke
Acoustics Group (GAUS)

2500 Université Blvd.
SHERBROOKE, Que.
J1K 2R1

Date of Response: March 26, 1990
Contact: Jean Nicolas
Title: Professor
Phone: (819) 821-7157
Fax: (819) 821-7903

Organization Type		Total Staffing		R&D Staffing	
Government Laboratory		1-24 Employees	Yes	Doctorate Level	4
Technology Centre		25-99 Employees		Master's Level	7
Community College		100-499 Employees		Bachelor's Level	6
University	Yes	500-999 Employees		Technologists	3
Industrial Company		1 000+ Employees		Total R&D Staff	20
Other (including Consulting)		Total Staff			

Type of R&D Performed		Vehicle Applicability		Manufacturing Process Expertise
Research	Yes	Alternate and Multifuel		Metal Manufacturing Processes
Product Design		Electric and Hybrid		Plastics Manufacturing Processes
Manufacturing Processes		Cars and Vans	Yes	Mfg. Machinery and Equipment
Industrial Engineering	Yes	Off-road Vehicles		Robotics
Plant and Env. Hazards Eng.		Trucks, Buses, Trailers	Yes	Other Manufacturing Processes
Test and Evaluation		Specialty Vehicles		

Knowledge Specialty			Automotive Component Specialty
Aero and Fluid Dynamics	Finishes and Coatings		Body and Structure
CAD, CAM, CIM	Noise and Vibration	10	Electrical System
Finite Element Analysis	Simulation and Modelling		Engines
Fuels and Lubricants	Stress/Strain/Stiffness		Emission Controls
Ergonomics and Industrial Design	Systems Integration		Heating, Ventilation and A/C
Joining and Fastening	Other		Instruments and Controls
Materials: Ferrous Metals			Interior Trim and Components
Materials: Non-ferrous Metals			Steering, Suspension, Brakes
Materials: Plastics			Transmission
Materials: Composites			Safety
Materials: Rubber			Wheels and Tires
Materials: Glass			Diagnostic and Service Equipment
Materials: Electrical/Electronic			

Affiliations With Other Organizations
IRSST, CRSNG, FCAR, Bombardier, Canadair, Venmar, Fiberglas, Hydro-Québec.

R&D Projects
Acoustic quieting of air-conditioning equipment. Noise control of machinery. Acoustic and vibration treatment of a regional aircraft. Vibration and acoustic radiation of mechanically coupled structures.

Special R&D Facilities
Semi anechoic chamber. Three two-channel analyzers (BK 2032, BK 3360, BK 2133). One super computer (IRIS 120 SD/4X), four parallel processors. Two-channel digital recorder. Simulation software for acoustics and vibration of semi-complex structures; simulation of outdoor sound propagation, simulation of transmission and adsorption of multiple layers of materials. Floor Space Devoted to R&D: Not Reported.

University of New Brunswick
Manufacturing Technology Centre

P.O. Box 4400
FREDERICTON, N.B.
E3B 5A3

Date of Response: May 2, 1990
Contact: Evelyn Richards
Title: Director
Phone: (506) 453-3533
Fax: (506) 453-5025

Organization Type		Total Staffing		R&D Staffing	
Government Laboratory		1-24 Employees	Yes	Doctorate Level	
Technology Centre		25-99 Employees		Master's Level	3
Community College		100-499 Employees		Bachelor's Level	5
University	Yes	500-999 Employees		Technologists	
Industrial Company		1 000+ Employees		Total R&D Staff	
Other (including Consulting)		Total Staff			

Type of R&D Performed		Vehicle Applicability		Manufacturing Process Expertise	
Research	Yes	Alternate and Multifuel		Metal Manufacturing Processes	
Product Design		Electric and Hybrid		Plastics Manufacturing Processes	
Manufacturing Processes		Cars and Vans		Mfg. Machinery and Equipment	
Industrial Engineering		Off-road Vehicles		Robotics	2
Plant and Env. Hazards Eng.		Trucks, Buses, Trailers		Other Manufacturing Processes	
Test and Evaluation		Specialty Vehicles			

Knowledge Specialty				Automotive Component Specialty	
Aero and Fluid Dynamics		Finishes and Coatings		Body and Structure	
CAD, CAM, CIM	10	Noise and Vibration		Electrical System	
Finite Element Analysis	9	Simulation and Modelling		Engines	
Fuels and Lubricants		Stress/Strain/Stiffness		Emission Controls	
Ergonomics and Industrial Design		Systems Integration		Heating, Ventilation and A/C	
Joining and Fastening		Other		Instruments and Controls	
Materials: Ferrous Metals				Interior Trim and Components	
Materials: Non-ferrous Metals				Steering, Suspension, Brakes	
Materials: Plastics				Transmission	
Materials: Composites				Safety	
Materials: Rubber				Wheels and Tires	
Materials: Glass				Diagnostic and Service Equipment	
Materials: Electrical/Electronic					

Affiliations With Other Organizations
None Reported.

R&D Projects
None Reported.

Special R&D Facilities
Extensive capability in computer-aided design, engineering and manufacturing software. Sawmill simulation, expert systems, finite element modelling. Floor Space Devoted to R&D: Not Reported.

University of Ottawa

OTTAWA, Ont.
K1N 6N5

Date of Response: March 30, 1990
Contact: Nicole Begin-Heick, PhD
Title: Dean, Graduate Studies and Research
Phone: (613) 564-5952

Organization Type	
Government Laboratory	
Technology Centre	
Community College	
University	Yes
Industrial Company	
Other (including Consulting)	

Total Staffing	
1-24 Employees	
25-99 Employees	
100-499 Employees	
500-999 Employees	
1 000+ Employees	Yes
Total Staff	3 700

R&D Staffing	
Doctorate Level	1 000
Master's Level	600
Bachelor's Level	1 100
Technologists	200
Total R&D Staff	2 900

Type of R&D Performed	
Research	Yes
Product Design	Yes
Manufacturing Processes	Yes
Industrial Engineering	
Plant and Env. Hazards Eng.	
Test and Evaluation	

Vehicle Applicability	
Alternate and Multifuel	
Electric and Hybrid	Yes
Cars and Vans	Yes
Off-road Vehicles	
Trucks, Buses, Trailers	Yes
Specialty Vehicles	

Manufacturing Process Expertise	
Metal Manufacturing Processes	2
Plastics Manufacturing Processes	6
Mfg. Machinery and Equipment	6
Robotics	7
Other Manufacturing Processes	3

Knowledge Specialty	
Aero and Fluid Dynamics	7
CAD, CAM, CIM	7
Finite Element Analysis	7
Fuels and Lubricants	8
Ergonomics and Industrial Design	2
Joining and Fastening	3
Materials: Ferrous Metals	3
Materials: Non-ferrous Metals	1
Materials: Plastics	5
Materials: Composites	6
Materials: Rubber	2
Materials: Glass	
Materials: Electrical/Electronic	3
Finishes and Coatings	
Noise and Vibration	3
Simulation and Modelling	6
Stress/Strain/Stiffness	6
Systems Integration	4
Other	9

Automotive Component Specialty	
Body and Structure	2
Electrical System	6
Engines	9
Emission Controls	3
Heating, Ventilation and A/C	3
Instruments and Controls	3
Interior Trim and Components	
Steering, Suspension, Brakes	2
Transmission	4
Safety	4
Wheels and Tires	
Diagnostic and Service Equipment	6

Affiliations With Other Organizations

Alcan/Unique Mobility. General Motors Sunrayce. Electric Vehicle Association of Canada. National Defence.

R&D Projects

Flywheel/motor development. Batteries and photovoltaic power systems for electric vehicles. Performance of diesel engines at low temperatures and/or with off-specification fuels. Design of solar car for GM Sunrayce.

Special R&D Facilities

Low temperature diesel engine laboratory. Flywheel design and test facility. Electrochemical science and technology laboratory. Automated composites manufacturing laboratory. CAD/CAM facility. Floor Space Devoted to R&D: 28 000 m^2.

University of Ottawa
Department of Mechanical Engineering

770 King Edward Avenue
OTTAWA, Ont.
K1N 6N5

Date of Response: June 14, 1990
Contact: Dr. Ralph Flanagan
Title: Professor
Phone: (613) 564-4093
Fax: (613) 564-5879

Organization Type	
Government Laboratory	
Technology Centre	
Community College	
University	Yes
Industrial Company	
Other (including Consulting)	

Total Staffing	
1-24 Employees	Yes
25-99 Employees	
100-499 Employees	
500-999 Employees	
1 000+ Employees	
Total Staff	

R&D Staffing	
Doctorate Level	2
Master's Level	3
Bachelor's Level	1
Technologists	1
Total R&D Staff	

Type of R&D Performed	
Research	Yes
Product Design	
Manufacturing Processes	
Industrial Engineering	
Plant and Env. Hazards Eng.	
Test and Evaluation	Yes

Vehicle Applicability	
Alternate and Multifuel	Yes
Electric and Hybrid	Yes
Cars and Vans	
Off-road Vehicles	
Trucks, Buses, Trailers	
Specialty Vehicles	

Manufacturing Process Expertise	
Metal Manufacturing Processes	
Plastics Manufacturing Processes	
Mfg. Machinery and Equipment	
Robotics	
Other Manufacturing Processes	

Knowledge Specialty	
Aero and Fluid Dynamics	
CAD, CAM, CIM	
Finite Element Analysis	
Fuels and Lubricants	
Ergonomics and Industrial Design	
Joining and Fastening	
Materials: Ferrous Metals	
Materials: Non-ferrous Metals	
Materials: Plastics	
Materials: Composites	8
Materials: Rubber	
Materials: Glass	
Materials: Electrical/Electronic	
Finishes and Coatings	
Noise and Vibration	
Simulation and Modelling	
Stress/Strain/Stiffness	
Systems Integration	
Other	

Automotive Component Specialty	
Body and Structure	
Electrical System	
Engines	8
Emission Controls	
Heating, Ventilation and A/C	
Instruments and Controls	
Interior Trim and Components	
Steering, Suspension, Brakes	
Transmission	
Safety	
Wheels and Tires	
Diagnostic and Service Equipment	

Affiliations With Other Organizations
None Reported.

R&D Projects
Low temperature diesel start/operability. Evaluation of diesel engine multiple injection. Development of a flywheel/electric surge power unit for electric vehicles.

Special R&D Facilities
SAE standard performance tests; indicated performance and combustion monitor engine/fuel tests. Low temperature (-57°C) engine test. Manufacture and test high energy storage rotors. Floor Space Devoted to R&D: Not Reported.

University of Ottawa
Electrochemical Science and Technology Centre

33 Mann Avenue
OTTAWA, Ont.
K1N 6N5

Date of Response: March 22, 1990
Contact: Mr. Gibs Song
Title: Research Engineer
Phone: (613) 564-6818
Fax: (613) 564-9842

Organization Type	
Government Laboratory	
Technology Centre	
Community College	
University	Yes
Industrial Company	
Other (including Consulting)	

Total Staffing	
1-24 Employees	Yes
25-99 Employees	
100-499 Employees	
500-999 Employees	
1 000+ Employees	
Total Staff	

R&D Staffing	
Doctorate Level	7
Master's Level	3
Bachelor's Level	5
Technologists	7
Total R&D Staff	22

Type of R&D Performed	
Research	Yes
Product Design	
Manufacturing Processes	
Industrial Engineering	
Plant and Env. Hazards Eng.	
Test and Evaluation	Yes

Vehicle Applicability	
Alternate and Multifuel	Yes
Electric and Hybrid	Yes
Cars and Vans	
Off-road Vehicles	
Trucks, Buses, Trailers	
Specialty Vehicles	Yes

Manufacturing Process Expertise	
Metal Manufacturing Processes	
Plastics Manufacturing Processes	
Mfg. Machinery and Equipment	
Robotics	
Other Manufacturing Processes	3

Knowledge Specialty			
Aero and Fluid Dynamics	6	Finishes and Coatings	5
CAD, CAM, CIM	7	Noise and Vibration	5
Finite Element Analysis	7	Simulation and Modelling	10
Fuels and Lubricants	5	Stress/Strain/Stiffness	3
Ergonomics and Industrial Design	8	Systems Integration	9
Joining and Fastening	7	Other	7
Materials: Ferrous Metals	2		
Materials: Non-ferrous Metals	2		
Materials: Plastics	5		
Materials: Composites	5		
Materials: Rubber	5		
Materials: Glass	3		
Materials: Electrical/Electronic	10		

Automotive Component Specialty	
Body and Structure	5
Electrical System	10
Engines	2
Emission Controls	7
Heating, Ventilation and A/C	2
Instruments and Controls	7
Interior Trim and Components	3
Steering, Suspension, Brakes	3
Transmission	5
Safety	7
Wheels and Tires	5
Diagnostic and Service Equipment	5

Affiliations With Other Organizations
World Electric Vehicle Association, Electric Vehicle Association of Canada, Electric Vehicle Council of Ottawa.

R&D Projects
Electric vehicle R&D, propulsion system R&D, medical power source R&D, communication device power source R&D, photovoltaic energy source R&D, other advanced power sources R&D, consulting on corrosion and waste management.

Special R&D Facilities
Environmental chamber, battery surge tester, 600 V/50 A power supply, seven electric vehicle test beds, electric vehicle operation simulation package. Floor Space Devoted to R&D: 2 000 m^2.

University of Toronto
Department of Chemical Engineering and Applied Chemistry

200 College Street
TORONTO, Ont.
M5S 1A4

Date of Response: April 6, 1990
Contact: Professor James W. Smith
Title: Chairman
Phone: (416) 978-4020
Fax: (416) 978-8065

Organization Type		**Total Staffing**		**R&D Staffing**	
Government Laboratory		1-24 Employees		Doctorate Level	40
Technology Centre		25-99 Employees		Master's Level	15
Community College		100-499 Employees	Yes	Bachelor's Level	5
University	Yes	500-999 Employees		Technologists	5
Industrial Company		1 000+ Employees		Total R&D Staff	65
Other (including Consulting)		Total Staff			

Type of R&D Performed		**Vehicle Applicability**		**Manufacturing Process Expertise**	
Research	Yes	Alternate and Multifuel	Yes	Metal Manufacturing Processes	
Product Design		Electric and Hybrid		Plastics Manufacturing Processes	10
Manufacturing Processes		Cars and Vans		Mfg. Machinery and Equipment	
Industrial Engineering		Off-road Vehicles		Robotics	
Plant and Env. Hazards Eng.	Yes	Trucks, Buses, Trailers		Other Manufacturing Processes	
Test and Evaluation	Yes	Specialty Vehicles			

Knowledge Specialty				**Automotive Component Specialty**	
Aero and Fluid Dynamics	10	Finishes and Coatings	2	Body and Structure	
CAD, CAM, CIM	1	Noise and Vibration		Electrical System	
Finite Element Analysis	2	Simulation and Modelling	10	Engines	1
Fuels and Lubricants	5	Stress/Strain/Stiffness	5	Emission Controls	5
Ergonomics and Industrial Design		Systems Integration	3	Heating, Ventilation and A/C	2
Joining and Fastening	2	Other		Instruments and Controls	
Materials: Ferrous Metals				Interior Trim and Components	5
Materials: Non-ferrous Metals	10			Steering, Suspension, Brakes	
Materials: Plastics	10			Transmission	
Materials: Composites	10			Safety	3
Materials: Rubber	8			Wheels and Tires	
Materials: Glass	8			Diagnostic and Service Equipment	
Materials: Electrical/Electronic					

Affiliations With Other Organizations

All University of Toronto departments, MRCO, OCMR, ICST, Centre for Chemical Process Metallurgy, Centre for Nuclear Studies, Centre for Indoor Air Quality.

R&D Projects

Advanced materials. Polymers and reinforced plastics. Engineered plastics. Environmental assessment and control. Occupational health and safety. Biomaterials. Biochemical engineering. Waste and effluent management. Comminution.

Special R&D Facilities

Analytical: GC, GC/MS, GC (FID, EC, PID, TC, etc.), FTIR, IR, ion chromatography, NAA, ICP, etc. Computers include Cray, IBM, VAX, etc. Floor Space Devoted to R&D: 3 500 m^2.

University of Toronto
Department of Chemical Engineering and Applied Chemistry

200 College Street
TORONTO, Ont.
M5S 1A4

Date of Response: March 23, 1990
Contact: Raymond T. Woodhams
Title: Professor
Phone: (416) 978-6991
Fax: (416) 978-8605

Organization Type

Government Laboratory	
Technology Centre	
Community College	
University	Yes
Industrial Company	
Other (including Consulting)	

Total Staffing

1-24 Employees	
25-99 Employees	
100-499 Employees	
500-999 Employees	
1 000+ Employees	Yes
Total Staff	30 000

R&D Staffing

Doctorate Level	500
Master's Level	900
Bachelor's Level	1200
Technologists	200
Total R&D Staff	3000

Type of R&D Performed

Research	Yes
Product Design	Yes
Manufacturing Processes	Yes
Industrial Engineering	Yes
Plant and Env. Hazards Eng.	Yes
Test and Evaluation	Yes

Vehicle Applicability

Alternate and Multifuel	Yes
Electric and Hybrid	Yes
Cars and Vans	Yes
Off-road Vehicles	Yes
Trucks, Buses, Trailers	Yes
Specialty Vehicles	Yes

Manufacturing Process Expertise

Metal Manufacturing Processes	10
Plastics Manufacturing Processes	10
Mfg. Machinery and Equipment	10
Robotics	10
Other Manufacturing Processes	10

Knowledge Specialty

Aero and Fluid Dynamics	10
CAD, CAM, CIM	10
Finite Element Analysis	10
Fuels and Lubricants	10
Ergonomics and Industrial Design	10
Joining and Fastening	10
Materials: Ferrous Metals	10
Materials: Non-ferrous Metals	10
Materials: Plastics	10
Materials: Composites	10
Materials: Rubber	1
Materials: Glass	1
Materials: Electrical/Electronic	5
Finishes and Coatings	5
Noise and Vibration	1
Simulation and Modelling	9
Stress/Strain/Stiffness	10
Systems Integration	10
Other	

Automotive Component Specialty

Body and Structure	10
Electrical System	10
Engines	10
Emission Controls	5
Heating, Ventilation and A/C	5
Instruments and Controls	5
Interior Trim and Components	5
Steering, Suspension, Brakes	5
Transmission	1
Safety	1
Wheels and Tires	1
Diagnostic and Service Equipment	2

Affiliations With Other Organizations

Ontario Centre for Materials Research. Manufacturing Research Centre of Ontario. Institute for Aerospace Studies.

R&D Projects

Polymer alloys and blends, reactive processing. Recycling of newsprint and plastics waste. Advanced composites, defence armour. Self-reinforced plastics — profile, sheet. Software, process design for manufacturing. Plastics welding and lamination stamping.

Special R&D Facilities

First rolling mill for plastics. Grinding/classification facility — fillers. Pulp and paper laboratory — wood fibre composites. Plastics engineering laboratory — fully equipped. Pollution control facilities — air, water, soil. Radiation/ nuclear laboratories. Floor Space Devoted to R&D: Over 100 000 m^2.

University of Toronto
VLSI Research Group
Department of Electrical Engineering

TORONTO, Ont.
M5S 1A4

Date of Response: April 2, 1990
Contact: Professor C.A.T. Salama
Title: Chairman
Phone: (416) 978-8658
Fax: (416) 978-4516

Organization Type	
Government Laboratory	
Technology Centre	
Community College	
University	Yes
Industrial Company	
Other (including Consulting)	

Total Staffing	
1-24 Employees	
25-99 Employees	Yes
100-499 Employees	
500-999 Employees	
1 000+ Employees	
Total Staff	60

R&D Staffing	
Doctorate Level	6
Master's Level	40
Bachelor's Level	
Technologists	6
Total R&D Staff	24

Type of R&D Performed	
Research	Yes
Product Design	
Manufacturing Processes	
Industrial Engineering	
Plant and Env. Hazards Eng.	
Test and Evaluation	

Vehicle Applicability
Alternate and Multifuel
Electric and Hybrid
Cars and Vans
Off-road Vehicles
Trucks, Buses, Trailers
Specialty Vehicles

Manufacturing Process Expertise
Metal Manufacturing Processes
Plastics Manufacturing Processes
Mfg. Machinery and Equipment
Robotics
Other Manufacturing Processes

Knowledge Specialty
Aero and Fluid Dynamics
CAD, CAM, CIM
Finite Element Analysis
Fuels and Lubricants
Ergonomics and Industrial Design
Joining and Fastening
Materials: Ferrous Metals
Materials: Non-ferrous Metals
Materials: Plastics
Materials: Composites
Materials: Rubber
Materials: Glass
Materials: Electrical/Electronic
Finishes and Coatings
Noise and Vibration
Simulation and Modelling
Stress/Strain/Stiffness
Systems Integration
Other

Automotive Component Specialty	
Body and Structure	
Electrical System	5
Engines	
Emission Controls	
Heating, Ventilation and A/C	
Instruments and Controls	
Interior Trim and Components	
Steering, Suspension, Brakes	
Transmission	
Safety	
Wheels and Tires	
Diagnostic and Service Equipment	

Affiliations With Other Organizations
None Reported.

R&D Projects
Microchip design for signal processing applications.

Special R&D Facilities
High voltage and smart power integrated circuit design, fabrication and testing tools for automotive application. Floor Space Devoted to R&D: 400 m^2.

University of Toronto
Department of Mechanical Engineering

TORONTO, Ont.
M5S 1A4

Date of Response: March 23, 1990
Contact: J.K. Spelt
Title: Assistant Professor
Phone: (416) 978-5435
Fax: (416) 978-7753

Organization Type	
Government Laboratory	
Technology Centre	
Community College	
University	Yes
Industrial Company	
Other (including Consulting)	

Total Staffing	
1-24 Employees	
25-99 Employees	
100-499 Employees	
500-999 Employees	
1 000+ Employees	Yes
Total Staff	

R&D Staffing	
Doctorate Level	
Master's Level	
Bachelor's Level	
Technologists	
Total R&D Staff	

Type of R&D Performed	
Research	Yes
Product Design	
Manufacturing Processes	
Industrial Engineering	
Plant and Env. Hazards Eng.	
Test and Evaluation	Yes

Vehicle Applicability	
Alternate and Multifuel	
Electric and Hybrid	
Cars and Vans	Yes
Off-road Vehicles	Yes
Trucks, Buses, Trailers	Yes
Specialty Vehicles	Yes

Manufacturing Process Expertise	
Metal Manufacturing Processes	
Plastics Manufacturing Processes	
Mfg. Machinery and Equipment	
Robotics	
Other Manufacturing Processes	

Knowledge Specialty	
Aero and Fluid Dynamics	5
CAD, CAM, CIM	
Finite Element Analysis	8
Fuels and Lubricants	
Ergonomics and Industrial Design	
Joining and Fastening	10
Materials: Ferrous Metals	10
Materials: Non-ferrous Metals	
Materials: Plastics	8
Materials: Composites	8
Materials: Rubber	
Materials: Glass	
Materials: Electrical/Electronic	
Finishes and Coatings	8
Noise and Vibration	
Simulation and Modelling	10
Stress/Strain/Stiffness	10
Systems Integration	
Other	

Automotive Component Specialty	
Body and Structure	10
Electrical System	
Engines	
Emission Controls	
Heating, Ventilation and A/C	
Instruments and Controls	
Interior Trim and Components	
Steering, Suspension, Brakes	
Transmission	
Safety	
Wheels and Tires	
Diagnostic and Service Equipment	

Affiliations With Other Organizations
None Reported.

R&D Projects
Analysis and design of structural adhesive joints. Durability of adhesive joints. Crack initiation in structural adhesive joints. Fundamentals of adhesion.

Special R&D Facilities
Fatigue and fracture test facilities. Floor Space Devoted to R&D: Not Reported.

University of Toronto
CIM Laboratory
Department of Mechanical Engineering

TORONTO, Ont.
M5S 1A4

Date of Response: April 5, 1990
Contact: B. Benhabib
Title: Professor
Phone: (416) 978-3447
Fax: (416) 978-3447

Organization Type

Government Laboratory	
Technology Centre	
Community College	
University	Yes
Industrial Company	
Other (including Consulting)	

Total Staffing

1-24 Employees	Yes
25-99 Employees	
100-499 Employees	
500-999 Employees	
1 000+ Employees	
Total Staff	

R&D Staffing

Doctorate Level	2
Master's Level	4
Bachelor's Level	1
Technologists	
Total R&D Staff	19

Type of R&D Performed

Research	Yes
Product Design	
Manufacturing Processes	
Industrial Engineering	Yes
Plant and Env. Hazards Eng.	
Test and Evaluation	

Vehicle Applicability

Alternate and Multifuel	
Electric and Hybrid	
Cars and Vans	
Off-road Vehicles	
Trucks, Buses, Trailers	
Specialty Vehicles	

Manufacturing Process Expertise

Metal Manufacturing Processes	2
Plastics Manufacturing Processes	
Mfg. Machinery and Equipment	
Robotics	8
Other Manufacturing Processes	

Knowledge Specialty

Aero and Fluid Dynamics	
CAD, CAM, CIM	10
Finite Element Analysis	
Fuels and Lubricants	
Ergonomics and Industrial Design	
Joining and Fastening	
Materials: Ferrous Metals	
Materials: Non-ferrous Metals	
Materials: Plastics	
Materials: Composites	
Materials: Rubber	
Materials: Glass	
Materials: Electrical/Electronic	
Finishes and Coatings	
Noise and Vibration	
Simulation and Modelling	
Stress/Strain/Stiffness	
Systems Integration	
Other	

Automotive Component Specialty

- Body and Structure
- Electrical System
- Engines
- Emission Controls
- Heating, Ventilation and A/C
- Instruments and Controls
- Interior Trim and Components
- Steering, Suspension, Brakes
- Transmission
- Safety
- Wheels and Tires
- Diagnostic and Service Equipment

Affiliations With Other Organizations

None Reported.

R&D Projects

Off-line manufacturing cell programming; software development for production planning and control in job-shop environments; robotic sensor development; robotic vision; calibration of industrial robots; kinematics and dynamics of multi-arm robots; design and analysis of modular robots.

Special R&D Facilities

GMF S100 Robot and Loop Conveyor. Sun 3/60 and 4/60 work stations. Two image analysis systems (camera, digitizer, computer). Floor Space Devoted to R&D: 50 m^2.

University of Toronto
Engine R&D Laboratory
Department of Mechanical Engineering

5 King's College Road
TORONTO, Ont.
M5S 1A4

Date of Response: April 6, 1990
Contact: Professor J.S. Wallace
Title: Director
Phone: (416) 978-5736
Fax: (416) 978-7753

Organization Type		**Total Staffing**		**R&D Staffing**	
Government Laboratory		1-24 Employees		Doctorate Level	1
Technology Centre		25-99 Employees		Master's Level	1
Community College		100-499 Employees		Bachelor's Level	2
University	Yes	500-999 Employees		Technologists	2
Industrial Company		1 000+ Employees	Yes	Total R&D Staff	6
Other (including Consulting)		Total Staff			

Type of R&D Performed		**Vehicle Applicability**		**Manufacturing Process Expertise**	
Research	Yes	Alternate and Multifuel	Yes	Metal Manufacturing Processes	
Product Design		Electric and Hybrid		Plastics Manufacturing Processes	
Manufacturing Processes		Cars and Vans		Mfg. Machinery and Equipment	
Industrial Engineering		Off-road Vehicles		Robotics	
Plant and Env. Hazards Eng.		Trucks, Buses, Trailers		Other Manufacturing Processes	
Test and Evaluation		Specialty Vehicles			

Knowledge Specialty				**Automotive Component Specialty**	
Aero and Fluid Dynamics		Finishes and Coatings		Body and Structure	
CAD, CAM, CIM		Noise and Vibration		Electrical System	
Finite Element Analysis		Simulation and Modelling		Engines	10
Fuels and Lubricants	10	Stress/Strain/Stiffness		Emission Controls	10
Ergonomics and Industrial Design		Systems Integration		Heating, Ventilation and A/C	
Joining and Fastening		Other		Instruments and Controls	
Materials: Ferrous Metals				Interior Trim and Components	
Materials: Non-ferrous Metals				Steering, Suspension, Brakes	
Materials: Plastics				Transmission	
Materials: Composites				Safety	
Materials: Rubber				Wheels and Tires	
Materials: Glass				Diagnostic and Service Equipment	
Materials: Electrical/Electronic					

Affiliations With Other Organizations
None Reported.

R&D Projects
Basic combustion research, especially for alternative fuels (natural gas, propane, hydrogen and methanol) in spark ignition and diesel engines.

Special R&D Facilities
Engine test cells with 227-kW DC 7000-rpm dynamometer and 600-kW 10 000-rpm water brake dynamometer. Two CFR variable-compression ratio research engines (one spark ignition, one swirl chamber diesel) each with a 6-kW DC dynamometer. One single-cylinder DI diesel engine with 30-kW DC dynamometer. Steady-state emissions measurement of NOX, CO, unburned hydrocarbons, O_2 and CO_2, as well as smoke measurement by opacity meter and Bosch spotmeter. Floor Space Devoted to R&D: 450 m^2.

University of Toronto
Department of Metallurgy and Materials Science

TORONTO, Ont.
M5S 1A4

Date of Response: April 6, 1990
Contact: Zhirui Wang
Title: Assistant Professor
Phone: (416) 978-4412
Fax: (416) 978-4155

Organization Type	
Government Laboratory	
Technology Centre	
Community College	
University	Yes
Industrial Company	
Other (including Consulting)	

Total Staffing	
1-24 Employees	
25-99 Employees	Yes
100-499 Employees	
500-999 Employees	
1 000+ Employees	
Total Staff	50

R&D Staffing	
Doctorate Level	30
Master's Level	3
Bachelor's Level	2
Technologists	5
Total R&D Staff	40

Type of R&D Performed	
Research	Yes
Product Design	
Manufacturing Processes	
Industrial Engineering	
Plant and Env. Hazards Eng.	
Test and Evaluation	Yes

Vehicle Applicability	
Alternate and Multifuel	
Electric and Hybrid	
Cars and Vans	
Off-road Vehicles	
Trucks, Buses, Trailers	
Specialty Vehicles	

Manufacturing Process Expertise	
Metal Manufacturing Processes	
Plastics Manufacturing Processes	
Mfg. Machinery and Equipment	
Robotics	
Other Manufacturing Processes	

Knowledge Specialty	
Aero and Fluid Dynamics	
CAD, CAM, CIM	7
Finite Element Analysis	7
Fuels and Lubricants	
Ergonomics and Industrial Design	
Joining and Fastening	8
Materials: Ferrous Metals	10
Materials: Non-ferrous Metals	10
Materials: Plastics	10
Materials: Composites	10
Materials: Rubber	
Materials: Glass	
Materials: Electrical/Electronic	10
Finishes and Coatings	
Noise and Vibration	
Simulation and Modelling	10
Stress/Strain/Stiffness	10
Systems Integration	
Other	

Automotive Component Specialty	
Body and Structure	
Electrical System	
Engines	
Emission Controls	
Heating, Ventilation and A/C	
Instruments and Controls	
Interior Trim and Components	
Steering, Suspension, Brakes	
Transmission	
Safety	
Wheels and Tires	
Diagnostic and Service Equipment	

Affiliations With Other Organizations

Ontario Centre for Materials Research (OCMR). Centre for Nuclear Engineering. Canadian University-Industry Council on Advanced Ceramics (CUICAC). Centre for Chemical Process Metallurgy (C-CPM). Manufacturing Research Corporation of Ontario (MRCO).

R&D Projects

Advanced materials research includes joining of materials, mechanical properties of metal matrix and ceramic composite materials, nuclear materials, electronic materials, corrosion, fatigue and creep of materials, structure-property relationships in metals, ceramics, polymers and composites. Process metallurgy, mineral processing.

Special R&D Facilities

Facilities include process metallurgy heat treatment furnaces; conventional metallographic apparatus; mechanical testing machines (4 MTS, 4 Instron); apparatus for chemical analysis; two scanning electron microscopes; one scanning transmission electron microscope; advanced electronic material growth and characterization facilities; extensive computing facilities. Floor Space Devoted to R&D: 200 m^2.

University of Toronto
Robotics and Automation Laboratory
Department of Mechanical Engineering

5 King's College Road
TORONTO, Ont.
M5S 1A4

Date of Response: April 3, 1990
Contact: Professor A.A. Goldenberg
Title: Director
Phone: (416) 978-5745
Fax: (416) 978-7753

Organization Type

Government Laboratory	
Technology Centre	
Community College	
University	Yes
Industrial Company	
Other (including Consulting)	

Total Staffing

1-24 Employees	Yes
25-99 Employees	
100-499 Employees	
500-999 Employees	
1 000+ Employees	
Total Staff	16

R&D Staffing

Doctorate Level	8
Master's Level	4
Bachelor's Level	4
Technologists	1
Total R&D Staff	16

Type of R&D Performed

Research	Yes
Product Design	
Manufacturing Processes	
Industrial Engineering	
Plant and Env. Hazards Eng.	
Test and Evaluation	

Vehicle Applicability

Alternate and Multifuel	
Electric and Hybrid	
Cars and Vans	
Off-road Vehicles	
Trucks, Buses, Trailers	
Specialty Vehicles	

Manufacturing Process Expertise

Metal Manufacturing Processes	
Plastics Manufacturing Processes	
Mfg. Machinery and Equipment	
Robotics	10
Other Manufacturing Processes	

Knowledge Specialty

Aero and Fluid Dynamics	
CAD, CAM, CIM	10
Finite Element Analysis	
Fuels and Lubricants	
Ergonomics and Industrial Design	
Joining and Fastening	
Materials: Ferrous Metals	
Materials: Non-ferrous Metals	
Materials: Plastics	
Materials: Composites	
Materials: Rubber	
Materials: Glass	
Materials: Electrical/Electronic	
Finishes and Coatings	
Noise and Vibration	
Simulation and Modelling	
Stress/Strain/Stiffness	10
Systems Integration	8
Other	

Automotive Component Specialty

Body and Structure	
Electrical System	9
Engines	
Emission Controls	
Heating, Ventilation and A/C	
Instruments and Controls	10
Interior Trim and Components	
Steering, Suspension, Brakes	
Transmission	10
Safety	
Wheels and Tires	
Diagnostic and Service Equipment	

Affiliations With Other Organizations
None Reported.

R&D Projects
Adaptive control in manufacturing. Telerobotics for military company. Off-line programming. Control of dexterous robotic hands. Design of direct drive arms.

Special R&D Facilities
Robots, sensors, articulated grippers, actuators. Floor Space Devoted to R&D: 100 m^2.

University of Toronto
Faculty of Applied Science and Engineering

TORONTO, Ont.
M5S 1A4

Date of Response: June 15, 1990
Contact: Dr. G.W. Heinke
Title: Dean
Phone: (416) 978-3131

Organization Type		Total Staffing		R&D Staffing	
Government Laboratory		1-24 Employees		Doctorate Level	250
Technology Centre		25-99 Employees		Master's Level	250
Community College		100-499 Employees		Bachelor's Level	400
University	Yes	500-999 Employees		Technologists	100
Industrial Company		1 000+ Employees	Yes	Total R&D Staff	1000
Other (including Consulting)		Total Staff	4 000		

Type of R&D Performed		Vehicle Applicability		Manufacturing Process Expertise	
Research	Yes	Alternate and Multifuel	Yes	Metal Manufacturing Processes	
Product Design	Yes	Electric and Hybrid	Yes	Plastics Manufacturing Processes	
Manufacturing Processes	Yes	Cars and Vans	Yes	Mfg. Machinery and Equipment	
Industrial Engineering	Yes	Off-road Vehicles	Yes	Robotics	10
Plant and Env. Hazards Eng.	Yes	Trucks, Buses, Trailers	Yes	Other Manufacturing Processes	
Test and Evaluation	Yes	Specialty Vehicles	Yes		

Knowledge Specialty				Automotive Component Specialty	
Aero and Fluid Dynamics	10	Finishes and Coatings	8	Body and Structure	5
CAD, CAM, CIM	10	Noise and Vibration	5	Electrical System	10
Finite Element Analysis	9	Simulation and Modelling	10	Engines	10
Fuels and Lubricants	7	Stress/Strain/Stiffness	10	Emission Controls	10
Ergonomics and Industrial Design	7	Systems Integration	10	Heating, Ventilation and A/C	8
Joining and Fastening	8	Other		Instruments and Controls	8
Materials: Ferrous Metals	10			Interior Trim and Components	3
Materials: Non-ferrous Metals	10			Steering, Suspension, Brakes	6
Materials: Plastics	10			Transmission	6
Materials: Composites	10			Safety	6
Materials: Rubber	10			Wheels and Tires	6
Materials: Glass	6			Diagnostic and Service Equipment	2
Materials: Electrical/Electronic	10				

Affiliations With Other Organizations
None Reported.

R&D Projects
None Reported.

Special R&D Facilities
Engine research and development laboratory. Structural integrity and fatigue research laboratory. Self-reinforced plastics research and development laboratory. Robotics and automation laboratory. See other entries for University of Toronto. Floor Space Devoted to R&D: Not Reported.

University of Toronto
Institute of Aerospace Studies

4925 Dufferin Street
DOWNSVIEW, Ont.
M3H 5T6

Date of Response: March 27, 1990
Contact: Professor R.C. Tennyson
Title: Director
Phone: (416) 667-7712
Fax: (416) 667-7799

Organization Type

Government Laboratory	
Technology Centre	
Community College	
University	Yes
Industrial Company	
Other (including Consulting)	

Total Staffing

1-24 Employees	
25-99 Employees	Yes
100-499 Employees	
500-999 Employees	
1 000+ Employees	
Total Staff	66

R&D Staffing

Doctorate Level	25
Master's Level	8
Bachelor's Level	5
Technologists	11
Total R&D Staff	49

Type of R&D Performed

Research	Yes
Product Design	
Manufacturing Processes	
Industrial Engineering	
Plant and Env. Hazards Eng.	
Test and Evaluation	

Vehicle Applicability

- Alternate and Multifuel
- Electric and Hybrid
- Cars and Vans
- Off-road Vehicles
- Trucks, Buses, Trailers
- Specialty Vehicles

Manufacturing Process Expertise

- Metal Manufacturing Processes
- Plastics Manufacturing Processes
- Mfg. Machinery and Equipment
- Robotics
- Other Manufacturing Processes

Knowledge Specialty

Aero and Fluid Dynamics	10
CAD, CAM, CIM	
Finite Element Analysis	10
Fuels and Lubricants	
Ergonomics and Industrial Design	
Joining and Fastening	
Materials: Ferrous Metals	
Materials: Non-ferrous Metals	
Materials: Plastics	
Materials: Composites	10
Materials: Rubber	
Materials: Glass	
Materials: Electrical/Electronic	
Finishes and Coatings	
Noise and Vibration	10
Simulation and Modelling	
Stress/Strain/Stiffness	
Systems Integration	
Other	

Automotive Component Specialty

- Body and Structure
- Electrical System
- Engines
- Emission Controls
- Heating, Ventilation and A/C
- Instruments and Controls
- Interior Trim and Components
- Steering, Suspension, Brakes
- Transmission
- Safety
- Wheels and Tires
- Diagnostic and Service Equipment

Affiliations With Other Organizations

Part of Faculty of Applied Science and Engineering, University of Toronto.

R&D Projects

Projects are in aerospace, not specifically in automotive engineering.

Special R&D Facilities

Floor Space Devoted to R&D: Not Reported.

University of Waterloo
Institute for Improvement of Quality and Productivity

WATERLOO, Ont.
N2L 3G1

Date of Response: March 30, 1990
Contact: R.J. MacKay
Title: Director
Phone: (519) 888-4593
Fax: (519) 746-6592

Organization Type	
Government Laboratory	
Technology Centre	
Community College	
University	Yes
Industrial Company	
Other (including Consulting)	

Total Staffing	
1-24 Employees	Yes
25-99 Employees	
100-499 Employees	
500-999 Employees	
1 000+ Employees	
Total Staff	7

R&D Staffing	
Doctorate Level	1
Master's Level	
Bachelor's Level	2
Technologists	
Total R&D Staff	3

Type of R&D Performed	
Research	Yes
Product Design	
Manufacturing Processes	
Industrial Engineering	Yes
Plant and Env. Hazards Eng.	
Test and Evaluation	

Vehicle Applicability
Alternate and Multifuel
Electric and Hybrid
Cars and Vans
Off-road Vehicles
Trucks, Buses, Trailers
Specialty Vehicles

Manufacturing Process Expertise
Metal Manufacturing Processes
Plastics Manufacturing Processes
Mfg. Machinery and Equipment
Robotics
Other Manufacturing Processes

Knowledge Specialty
Aero and Fluid Dynamics
CAD, CAM, CIM
Finite Element Analysis
Fuels and Lubricants
Ergonomics and Industrial Design
Joining and Fastening
Materials: Ferrous Metals
Materials: Non-ferrous Metals
Materials: Plastics
Materials: Composites
Materials: Rubber
Materials: Glass
Materials: Electrical/Electronic
Finishes and Coatings
Noise and Vibration
Simulation and Modelling
Stress/Strain/Stiffness
Systems Integration
Other

Automotive Component Specialty
Body and Structure
Electrical System
Engines
Emission Controls
Heating, Ventilation and A/C
Instruments and Controls
Interior Trim and Components
Steering, Suspension, Brakes
Transmission
Safety
Wheels and Tires
Diagnostic and Service Equipment

Affiliations With Other Organizations
None Reported.

R&D Projects
Development of systems and methods for process improvement and cost reduction. Development of implementation strategies for total quality management. Development of methods to increase efficiency of product development.

Special R&D Facilities
Floor Space Devoted to R&D: Not Reported.

Vancouver Community College
Career Division

King Edward Campus
1155 E. Broadway
VANCOUVER, B.C.
V5T 4N3

Date of Response: **May 22, 1990**
Contact: **Sam Lewindon**
Title: **Chairman**
Phone: **(604) 875-6111**
Fax: **(604) 875-6605**

Organization Type		**Total Staffing**		**R&D Staffing**	
Government Laboratory		1-24 Employees		Doctorate Level	
Technology Centre		25-99 Employees	Yes	Master's Level	
Community College	Yes	100-499 Employees		Bachelor's Level	
University		500-999 Employees		Technologists	
Industrial Company		1 000+ Employees		Total R&D Staff	
Other (including Consulting)		Total Staff			

Type of R&D Performed		**Vehicle Applicability**		**Manufacturing Process Expertise**	
Research		Alternate and Multifuel	Yes	Metal Manufacturing Processes	
Product Design		Electric and Hybrid		Plastics Manufacturing Processes	
Manufacturing Processes		Cars and Vans	Yes	Mfg. Machinery and Equipment	
Industrial Engineering		Off-road Vehicles	Yes	Robotics	
Plant and Env. Hazards Eng.		Trucks, Buses, Trailers	Yes	Other Manufacturing Processes	
Test and Evaluation	Yes	Specialty Vehicles			

Knowledge Specialty				**Automotive Component Specialty**	
Aero and Fluid Dynamics		Finishes and Coatings	3	Body and Structure	
CAD, CAM, CIM		Noise and Vibration		Electrical System	
Finite Element Analysis		Simulation and Modelling		Engines	3
Fuels and Lubricants	3	Stress/Strain/Stiffness		Emission Controls	3
Ergonomics and Industrial Design		Systems Integration		Heating, Ventilation and A/C	
Joining and Fastening	3	Other		Instruments and Controls	
Materials: Ferrous Metals				Interior Trim and Components	
Materials: Non-ferrous Metals				Steering, Suspension, Brakes	3
Materials: Plastics				Transmission	3
Materials: Composites				Safety	
Materials: Rubber				Wheels and Tires	
Materials: Glass				Diagnostic and Service Equipment	
Materials: Electrical/Electronic	3				

Affiliations With Other Organizations
None Reported.

R&D Projects
None Reported.

Special R&D Facilities
Floor Space Devoted to R&D: Not Reported.

Vehicle Systems Development Corp.

49 Fifeshire Crescent
NEPEAN, Ont.
K2E 7J7

Date of Response: April 30, 1990
Contact: Dr. J.Y. Wong
Title: President
Phone: (613) 224-0697

Organization Type	
Government Laboratory	
Technology Centre	
Community College	
University	
Industrial Company	
Other (including Consulting)	Yes

Total Staffing	
1-24 Employees	Yes
25-99 Employees	
100-499 Employees	
500-999 Employees	
1 000+ Employees	
Total Staff	5

R&D Staffing	
Doctorate Level	1
Master's Level	1
Bachelor's Level	3
Technologists	
Total R&D Staff	5

Type of R&D Performed	
Research	Yes
Product Design	
Manufacturing Processes	
Industrial Engineering	
Plant and Env. Hazards Eng.	
Test and Evaluation	Yes

Vehicle Applicability	
Alternate and Multifuel	
Electric and Hybrid	
Cars and Vans	
Off-road Vehicles	Yes
Trucks, Buses, Trailers	Yes
Specialty Vehicles	Yes

Manufacturing Process Expertise	
Metal Manufacturing Processes	
Plastics Manufacturing Processes	
Mfg. Machinery and Equipment	
Robotics	
Other Manufacturing Processes	

Knowledge Specialty	
Aero and Fluid Dynamics	
CAD, CAM, CIM	10
Finite Element Analysis	6
Fuels and Lubricants	
Ergonomics and Industrial Design	
Joining and Fastening	
Materials: Ferrous Metals	
Materials: Non-ferrous Metals	
Materials: Plastics	
Materials: Composites	
Materials: Rubber	
Materials: Glass	
Materials: Electrical/Electronic	
Finishes and Coatings	
Noise and Vibration	
Simulation and Modelling	
Stress/Strain/Stiffness	
Systems Integration	
Other	

Automotive Component Specialty	
Body and Structure	
Electrical System	
Engines	
Emission Controls	
Heating, Ventilation and A/C	
Instruments and Controls	
Interior Trim and Components	
Steering, Suspension, Brakes	7
Transmission	8
Safety	8
Wheels and Tires	8
Diagnostic and Service Equipment	

Affiliations With Other Organizations

None Reported.

R&D Projects

Computer-aided methods for design and evaluation of off-road vehicles. Development of a snow model for the NATO reference mobility model (NRMM). Design evaluation of light armoured fighting vehicles and main battle tanks.

Special R&D Facilities

Computer-aided design and evaluation packages for off-road tracked and wheeled vehicles. Computerized terrain evaluation packages for vehicle mobility studies. Floor Space Devoted to R&D: 200 m^2.

W.R. Davis Engineering Limited

1260 Old Innes Road
OTTAWA, Ont.
K1B 3V3

Date of Response: March 21, 1990
Contact: Gary D. Roberts, P.Eng.
Title: Manager, Marketing
Phone: (613) 748-5500
Fax: (613) 748-3972

Organization Type		Total Staffing		R&D Staffing	
Government Laboratory		1-24 Employees		Doctorate Level	
Technology Centre		25-99 Employees	Yes	Master's Level	
Community College		100-499 Employees		Bachelor's Level	8
University		500-999 Employees		Technologists	5
Industrial Company		1 000+ Employees		Total R&D Staff	13
Other (including Consulting)	Yes	Total Staff	85		

Type of R&D Performed		Vehicle Applicability		Manufacturing Process Expertise	
Research	Yes	Alternate and Multifuel	Yes	Metal Manufacturing Processes	8
Product Design	Yes	Electric and Hybrid	Yes	Plastics Manufacturing Processes	
Manufacturing Processes	Yes	Cars and Vans	Yes	Mfg. Machinery and Equipment	10
Industrial Engineering		Off-road Vehicles	Yes	Robotics	3
Plant and Env. Hazards Eng.		Trucks, Buses, Trailers	Yes	Other Manufacturing Processes	
Test and Evaluation	Yes	Specialty Vehicles	Yes		

Knowledge Specialty				Automotive Component Specialty	
Aero and Fluid Dynamics	8	Finishes and Coatings	5	Body and Structure	5
CAD, CAM, CIM	8	Noise and Vibration	8	Electrical System	10
Finite Element Analysis	10	Simulation and Modelling	10	Engines	8
Fuels and Lubricants	7	Stress/Strain/Stiffness	10	Emission Controls	10
Ergonomics and Industrial Design	10	Systems Integration	10	Heating, Ventilation and A/C	5
Joining and Fastening		Other		Instruments and Controls	10
Materials: Ferrous Metals	8			Interior Trim and Components	
Materials: Non-ferrous Metals	8			Steering, Suspension, Brakes	10
Materials: Plastics				Transmission	5
Materials: Composites				Safety	5
Materials: Rubber				Wheels and Tires	10
Materials: Glass				Diagnostic and Service Equipment	
Materials: Electrical/Electronic	10				

Affiliations With Other Organizations

SAE.

R&D Projects

Vehicle compliance testing and evaluation. Deveopment and testing of automobile quick-release hand control system. Special equipment kitting. Over-the-road measurement of truck tire rolling resistance and bearing moment losses. Development of a derailment accident computer simulation model. Vehicle data acquisition system.

Special R&D Facilities

Hot gas wind tunnel. Tank/car — small scale test tank for burning tank/car studies. Truck tire rolling resistance test rig. R&D work occasionally contracted out to CSA, NRC, Transport Canada, etc. Floor Space Devoted to R&D: 500 m^2. Note: R&D space available up to 4 000 m^2 on demand.

WEGU Canada Inc.

1707 Harbour Street
P.O. Box 567
WHITBY, Ont.
L1N 5V3

Date of Response: March 23, 1990
Contact: Carl Laseta
Title: Assistant Administration Manager
Phone: (416) 668-2359
Fax: (416) 668-3414

Organization Type

Government Laboratory	
Technology Centre	
Community College	
University	
Industrial Company	Yes
Other (including Consulting)	

Total Staffing

1-24 Employees	
25-99 Employees	Yes
100-499 Employees	
500-999 Employees	
1 000+ Employees	
Total Staff	

R&D Staffing

Doctorate Level	
Master's Level	
Bachelor's Level	
Technologists	
Total R&D Staff	

Type of R&D Performed

Research	
Product Design	Yes
Manufacturing Processes	
Industrial Engineering	
Plant and Env. Hazards Eng.	
Test and Evaluation	

Vehicle Applicability

Alternate and Multifuel	
Electric and Hybrid	
Cars and Vans	Yes
Off-road Vehicles	
Trucks, Buses, Trailers	
Specialty Vehicles	

Manufacturing Process Expertise

Metal Manufacturing Processes	
Plastics Manufacturing Processes	10
Mfg. Machinery and Equipment	
Robotics	
Other Manufacturing Processes	10

Knowledge Specialty

Aero and Fluid Dynamics	
CAD, CAM, CIM	8
Finite Element Analysis	
Fuels and Lubricants	
Ergonomics and Industrial Design	
Joining and Fastening	
Materials: Ferrous Metals	
Materials: Non-ferrous Metals	
Materials: Plastics	8
Materials: Composites	
Materials: Rubber	10
Materials: Glass	
Materials: Electrical/Electronic	
Finishes and Coatings	
Noise and Vibration	
Simulation and Modelling	
Stress/Strain/Stiffness	
Systems Integration	
Other	

Automotive Component Specialty

Body and Structure	10
Electrical System	
Engines	
Emission Controls	
Heating, Ventilation and A/C	
Instruments and Controls	
Interior Trim and Components	
Steering, Suspension, Brakes	4
Transmission	
Safety	
Wheels and Tires	
Diagnostic and Service Equipment	

Affiliations With Other Organizations

Pioneer Engineering.

R&D Projects

None Reported.

Special R&D Facilities

Floor Space Devoted to R&D: Not Reported.

Weir-Jones Engineering Consultants Ltd.

1574 West 2nd Ave.
VANCOUVER, B.C.
V6J 1H2

Date of Response: March 22, 1990
Contact: Keith Witney
Title: Manager, Engineering
Phone: (604) 732-8821
Fax: (604) 732-4801

Organization Type	
Government Laboratory	
Technology Centre	
Community College	
University	
Industrial Company	
Other (including Consulting)	Yes

Total Staffing	
1-24 Employees	
25-99 Employees	Yes
100-499 Employees	
500-999 Employees	
1 000+ Employees	
Total Staff	

R&D Staffing	
Doctorate Level	1
Master's Level	2
Bachelor's Level	9
Technologists	3
Total R&D Staff	18

Type of R&D Performed	
Research	Yes
Product Design	Yes
Manufacturing Processes	
Industrial Engineering	
Plant and Env. Hazards Eng.	
Test and Evaluation	Yes

Vehicle Applicability	
Alternate and Multifuel	
Electric and Hybrid	
Cars and Vans	Yes
Off-road Vehicles	Yes
Trucks, Buses, Trailers	Yes
Specialty Vehicles	

Manufacturing Process Expertise	
Metal Manufacturing Processes	
Plastics Manufacturing Processes	2
Mfg. Machinery and Equipment	3
Robotics	
Other Manufacturing Processes	

Knowledge Specialty	
Aero and Fluid Dynamics	
CAD, CAM, CIM	
Finite Element Analysis	8
Fuels and Lubricants	
Ergonomics and Industrial Design	
Joining and Fastening	
Materials: Ferrous Metals	
Materials: Non-ferrous Metals	
Materials: Plastics	2
Materials: Composites	
Materials: Rubber	
Materials: Glass	
Materials: Electrical/Electronic	9
Finishes and Coatings	
Noise and Vibration	9
Simulation and Modelling	8
Stress/Strain/Stiffness	10
Systems Integration	9
Other	

Automotive Component Specialty	
Body and Structure	5
Electrical System	10
Engines	
Emission Controls	
Heating, Ventilation and A/C	
Instruments and Controls	5
Interior Trim and Components	
Steering, Suspension, Brakes	5
Transmission	
Safety	7
Wheels and Tires	
Diagnostic and Service Equipment	8

Affiliations With Other Organizations

None Reported.

R&D Projects

Vehicle vibration analysis. Intelligent acceleration sensors. Off-tool sample tests. Electronic module design. On-board truck weighing. Rail car crush tests.

Special R&D Facilities

Environmental chamber with shaker table. Microprocessor development system for 680XX, 6805, NSC800, COPS. Test data acquisition — data logging through 64 channels, high speed. CAD, finite element analysis. Real time vibration analysis. Electronics prototyping, design,layout. Floor Space Devoted to R&D: 500 m^2.

Wilson, Dario and Associates

1400 Windsor Avenue
WINDSOR, Ont.
N8X 3L9

Date of Response: March 26, 1990
Contact: N.A. Dario
Title: Vice President
Phone: (519) 258-8004
Fax: (519) 258-8006

Organization Type		**Total Staffing**		**R&D Staffing**	
Government Laboratory		1-24 Employees	Yes	Doctorate Level	
Technology Centre		25-99 Employees		Master's Level	
Community College		100-499 Employees		Bachelor's Level	
University		500-999 Employees		Technologists	
Industrial Company		1 000+ Employees		Total R&D Staff	
Other (including Consulting)	Yes	Total Staff			

Type of R&D Performed		**Vehicle Applicability**		**Manufacturing Process Expertise**	
Research		Alternate and Multifuel		Metal Manufacturing Processes	
Product Design		Electric and Hybrid		Plastics Manufacturing Processes	
Manufacturing Processes		Cars and Vans		Mfg. Machinery and Equipment	5
Industrial Engineering	Yes	Off-road Vehicles		Robotics	
Plant and Env. Hazards Eng.	Yes	Trucks, Buses, Trailers		Other Manufacturing Processes	
Test and Evaluation		Specialty Vehicles			

Knowledge Specialty				**Automotive Component Specialty**	
Aero and Fluid Dynamics	5	Finishes and Coatings		Body and Structure	
CAD, CAM, CIM	5	Noise and Vibration	5	Electrical System	
Finite Element Analysis		Simulation and Modelling		Engines	5
Fuels and Lubricants		Stress/Strain/Stiffness		Emission Controls	
Ergonomics and Industrial Design		Systems Integration		Heating, Ventilation and A/C	5
Joining and Fastening		Other		Instruments and Controls	
Materials: Ferrous Metals	5			Interior Trim and Components	
Materials: Non-ferrous Metals	5			Steering, Suspension, Brakes	
Materials: Plastics				Transmission	
Materials: Composites				Safety	
Materials: Rubber				Wheels and Tires	
Materials: Glass				Diagnostic and Service Equipment	
Materials: Electrical/Electronic					

Affiliations With Other Organizations

SAE. APEO. Consulting Engineers of Ontario (CEO). ASHRAE.

R&D Projects

Specialize in automotive-related building construction. Design (i.e. process piping), environmental controls, power, lighting, foundations, CAD layout of equipment, PLC equipment software.

Special R&D Facilities

Floor Space Devoted to R&D: Not Reported.

Capability Index

How to Use This Index

This index makes it easy to locate organizations who have reported automotive R&D capability in any of the multiple technical fields covered by this directory. For example, if you wish to learn who in Canada is involved with R&D in, say, aerodynamics, look on the Capability Index Table of Contents (the next page) under aerodynamics. This directs you to page 139, which lists all organizations claiming aerodynamics R&D capability. To find out more about any of these organizations, refer to the Table of Contents at the front of the directory and then to the particular entry.

Capability Index Table of Contents

Organization Type

Government Laboratories ... 130
Technology Centres ... 130
Community Colleges ... 130
Universities ... 130
Industrial Companies ... 131
Consultants and Other ... 131

Type of R&D Performed

Research ... 131
Product Design ... 132
Manufacturing Process Engineering ... 133
Industrial Engineering ... 133
Plant and Environmental Hazards Engineering ... 133
Testing and Evaluation ... 134

Vehicle Applicability

Alternate or Multifuel Vehicles ... 134
Electric or Hybrid Vehicles ... 135
Cars and Multi Purpose Vehicles ... 135
Off-road Vehicles ... 136
Trucks and Buses ... 136
Specialty and Other Vehicles ... 137

Manufacturing Process Expertise

Metal Manufacturing Processes ... 137
Plastics or Composites Manufacturing Processes ... 138
Machinery and Equipment for Manufacturing ... 138
Robotics ... 139
Other Manufacturing Process Expertise ... 139

Technical Areas of Expertise

Aerodynamics and Fluid Mechanics ... 139
CAD, CAM, CIM ... 140
Finite Element Analysis ... 141
Fuels and Lubricants ... 141
Ergonomics or Industrial Design ... 142
Joining and Fastening ... 142
Ferrous Metals ... 142
Non-ferrous Metals ... 143
Plastics ... 144
Composites ... 144
Rubber and Elastomers ... 145
Glass ... 145
Electrical or Electronic Materials ... 146
Finishes and Coatings ... 146
Noise and Vibration ... 147
Simulation and Modelling ... 147
Stress, Strain, Stiffness ... 148
Systems Integration ... 148
Other ... 149

Automotive Component Specialty

Body and Structure ... 149
Electrical System ... 149
Engines ... 150
Emission Control Systems ... 150
Heating, Ventilating and Air Conditioning ... 151
Instruments and Controls ... 151
Interior Trim and Components ... 151
Steering, Suspension, Brakes ... 152
Transmissions ... 152
Safety Systems or Components ... 152
Wheels or Tires ... 153
Diagnostic or Service Equipment ... 153

Capability Index

Organization Type

Government Laboratories

- Canadian Insitute of Industrial Technology
  - Division of Electrical Engineering
- Defence and Civil Institute of Environmental Medicine
  - Biodynamics Group
- Environment Canada
  - Vehicle Emissions Test Laboratory
- National Research Council
  - Environmental Protection Science
- National Research Council
  - Industrial Materials Research Institute
- Transport Canada
  - Motor Vehicle Test Centre

Technology Centres

- Centre de recherche industrielle du Québec (CRIQ)
- Centre spécialisé de technologie physique
- Composite Technological Materials Centre
- Hugh Macmillan Rehabilitation Centre
  - Rehabilitation Engineering
- Hydro-Québec
  - Laboratoire des technologies électrochimiques/électrotechniques
- Institut d'ordinique du Québec
- Management of Technology and Innovation Institute
- McMaster University
  - Centre for Flexible Manufacturing Research and Development
- McMaster University
  - Institute for Polymer Production
- National Institute of Magnesium Technology
- National Optics Institute
- Ontario Centre for Materials Research
- Société de Microélectronique Industrielle de Sherbrooke Inc.

Community Colleges

- Northern Alberta Institute of Technology
- Southern Alberta Institute of Technology
  - Auto-Diesel Department
- Vancouver Community College
  - Career Division

Universities

- Carleton University
- Carleton University
  - School of Industrial Design
- Concordia University
  - CONCAVE Research Centre
- Concordia University
  - Department of Mechanical Engineering
- Concordia University
  - Science Industrial Research Unit
- École Polytechnique de Montréal
- École Polytechnique de Montréal
  - Centre de caractérisation microscopique des matériaux
- École Polytechnique de Montréal
  - Centre de recherche appliquée sur les polymères (CRASP)
- Lakehead University
  - Department of Mechanical Engineering
- McGill University
  - CSIRA Steel Processing Laboratory
- McGill University
  - Department of Mining and Metallurgical Engineering
- McGill University
  - Department of Metallurgical Engineering
- McMaster University
  - Department of Mechanical Engineering
- Queen's University
  - Department of Chemistry
- Queen's University
  - Department of Mechanical Engineering
- Queen's University
  - Department of Metallurgical Engineering
- Ryerson Polytechnical Institute
  - Office of Research and Innovation
- Simon Fraser University
  - School of Engineering Science
- Technical University of Nova Scotia
  - Department of Mechanical Engineering
- The University of British Columbia
  - Department of Electrical Engineering
- The University of British Columbia
  - Department of Mechanical Engineering
- The University of Western Ontario
  - Surface Science Western
- Université Laval
  - CERSIM
- Université Laval
  - Department of Mechanical Engineering
- Université Laval
  - LIPAO, Department of Chemical Engineering
- Université de Sherbrooke
  - Acoustics Group (GAUS)
- University of New Brunswick
  - Manufacturing Technology Centre
- University of Ottawa
- University of Ottawa
  - Department of Mechanical Engineering
- University of Ottawa
  - Electrochemical Science and Technology Centre
- University of Toronto
  - Department of Chemical Engineering and Applied Chemistry
- University of Toronto
  - Department of Chemical Engineering and Applied Chemistry
- University of Toronto
  - Department of Electrical Engineering, VLSI Research Group
- University of Toronto
  - Department of Mechanical Engineering
- University of Toronto
  - Department of Mechanical Engineering, CIM Laboratory
- University of Toronto
  - Department of Mechanical Engineering, Engine R&D Laboratory
- University of Toronto
  - Department of Metallurgy and Materials Science
- University of Toronto
  - Department of Mechanical Engineering, Robotics and Automation Laboratory
- University of Toronto
  - Faculty of Applied Science and Engineering
- University of Toronto
  - Institute of Aerospace Studies
- University of Waterloo
  - Institute for Improvement of Quality and Productivity

Industrial Companies

Acustar Canada Inc.
  Ajax Trim Division
Canadian General-Tower Limited
Circo Craft
Command Start Inc.
DBM Reflex Entreprise Inc.
DSMA International Inc.
Diffracto Limited
Eberhard Hardware Manufacturing Limited
Fiberglas Canada Inc.
Gates Power Drive Products Inc.
General Kinetics Engineering Corp.
Global Sensor Systems Inc.
Goshen Rubber of Canada Limited
Hematite Manufacturing
Hydro-Québec Research Institute
IPL Inc.
Ingenious Devices Ltd.
Ingersoll-Rand Canada Inc.
  Torrington Division
KVB Manufacturing
Long Manufacturing Ltd.
METCOR Inc.
Magna International
NARMCO National Auto Radiator Manufacturing Co.
Pavaco Plastics Inc.
Rockwell International of Canada Ltd.
SKD Company
Sensor Adaptive Machines Inc. (SAMI)
Siemens Automotive Ltd.
  Induction/Cooling Division
Stelco Inc.
TES Limited
Uniroyal Goodrich
WEGU Canada Inc.

Consultants and Other Organizations

Biokinetics and Associates Ltd.
Cartech Consulting Services
Centre de consultation et de formation en automatique
  et ordinique (CFAO)
F.E.L. Consultants Limited
F.T. Gerson Limited
Forensic Engineering
Forming Technologies Incorporated
Gad Shaanan Designs Inc.
Glos Engineering Ltd.
Hawtal Whiting of Canada Ltd.
Hoemsen & Associates
KTC Testing & Development Inc.
MacLennan Associates
Manufacturing Research Corporation of Ontario
ORTECH International
Protrans Design Team
Rutenberg Design Inc.
Sambrook & Hermetz Industrial Designers
Spectrum Engineering Corporation Ltd.
TAVA Corporation
Thermotech Engineering
Vehicle Systems Development Corp.
W.R. Davis Engineering Limited
Weir-Jones Engineering Consultants Ltd.
Wilson, Dario & Associates

Type of R&D Performed

Research

Biokinetics and Associates Ltd.
CADMI Microelectronics/microélectronique Inc.
Canadian Institute of Industrial Technology
  Division of Electrical Engineering
Carleton University
Carleton University
  School of Industrial Design
Centre de consultation et de formation en automatique
  et ordinique (CFAO)
Centre de recherche industrielle du Québec (CRIQ)
Composite Technological Materials Centre
Concordia University
  CONCAVE Research Centre
Concordia University
  Department of Mechanical Engineering
DBM Reflex Entreprise Inc.
Defence and Civil Institute of Environmental Medicine
  Biodynamics Group
Diffracto Limited
Eberhard Hardware Manufacturing Limited
École Polytechnique de Montréal
  Centre de caractérisation microscopique des matériaux
École Polytechnique de Montréal
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F.T. Gerson Limited
Fiberglas Canada Inc.
Gates Power Drive Products Inc.
Goshen Rubber of Canada Limited
Hoemsen & Associates
Hydro-Québec
  Laboratoire des technologies électrochimiques/électrotechniques
Hydro-Québec Research Institute
IPL Inc.
KTC Testing & Development Inc.
Lakehead University
  Department of Mechanical Engineering
Manufacturing Research Corporation of Ontario
McGill University
  CSIRA Steel Processing Laboratory
McGill University
  Department of Mining and Metallurgical Engineering
McGill University
  Department of Metallurgical Engineering
McMaster University
  Centre for Flexible Manufacturing Research and Development
McMaster University
  Department of Mechanical Engineering
McMaster University
  Institute for Polymer Production
National Institute of Magnesium Technology
National Optics Institute
National Research Council
  Environmental Protection Science
National Research Council
  Industrial Materials Research Institute
Northern Alberta Institute of Technology
ORTECH International
Ontario Centre for Materials Research
Pavaco Plastics Inc.
Protrans Design Team
Queen's University
  Department of Chemistry

Research cont'd

- Queen's University
  - Department of Mechanical Engineering
- Queen's University
  - Department of Metallurgical Engineering
- Rutenberg Design Inc.
- Ryerson Polytechnical Institute
  - Office of Research and Innovation
- Simon Fraser University
  - School of Engineering Science
- Société de Microélectronique Industrielle de Sherbrooke Inc.
- Spectrum Engineering Corporation Ltd.
- Stelco Inc.
- TES Limited
- The University of British Columbia
  - Department of Mechanical Engineering
- The University of Western Ontario
  - Surface Science Western
- Thermotech Engineering
- Université Laval
  - CERSIM
- Université Laval
  - LIPAO, Department of Chemical Engineering
- Université de Sherbrooke
  - Acoustics Group (GAUS)
- University of New Brunswick
  - Manufacturing Technology Centre
- University of Ottawa
- University of Ottawa
  - Department of Mechanical Engineering
- University of Ottawa
  - Electrochemical Science and Technology Centre
- University of Toronto
  - Department of Chemical Engineering and Applied Chemistry
- University of Toronto
  - Department of Chemical Engineering and Applied Chemistry
- University of Toronto
  - Department of Electrical Engineering, VLSI Research Group
- University of Toronto
  - Department of Mechanical Engineering
- University of Toronto
  - Department of Mechanical Engineering, CIM Laboratory
- University of Toronto
  - Department of Mechanical Engineering, Engine R&D Laboratory
- University of Toronto
  - Department of Metallurgy and Materials Science
- University of Toronto
  - Department of Mechanical Engineering, Robotics and Automation Laboratory
- University of Toronto
  - Faculty of Applied Science and Engineering
- University of Toronto
  - Institute of Aerospace Studies
- University of Waterloo
  - Institute for Improvement of Quality and Productivity
- Vehicle Systems Development Corp.
- W.R. Davis Engineering Limited
- Weir-Jones Engineering Consultants Ltd.

Product Design

- Acustar Canada Inc.
  - Ajax Trim Division
- Annectron Engineering Inc.
- Biokinetics and Associates Ltd.
- CADMI Microelectronics/microélectronique Inc.
- Carleton University
- Carleton University
  - School of Industrial Design
- Cartech Consulting Services
- Centre de consultation et de formation en automatique et ordinique (CFAO)
- Centre de recherche industrielle du Québec (CRIQ)
- Centre spécialisé de technologie physique
- Command Start Inc.
- Composite Technological Materials Centre
- Concordia University
  - CONCAVE Research Centre
- DBM Reflex Entreprise Inc.
- Diffracto Limited
- Eberhard Hardware Manufacturing Limited
- École Polytechnique de Montréal
  - Centre de caractérisation microscopique des matériaux
- F.T. Gerson Limited
- Fiberglas Canada Inc.
- Gad Shaanan Designs Inc.
- Gates Power Drive Products Inc.
- General Kinetics Engineering Corp.
- Global Sensor Systems Inc.
- Goshen Rubber of Canada Limited
- Hawtal Whiting of Canada Ltd.
- Hematite Manufacturing
- Hoemsen & Associates
- IPL Inc.
- Ingenious Devices Ltd.
- Institut d'ordinique du Québec
- KTC Testing & Development Inc.
- KVB Manufacturing
- Lakehead University
  - Department of Mechanical Engineering
- Long Manufacturing Ltd.
- MacLennan Associates
- Magna International
- Manufacturing Research Corporation of Ontario
- McMaster University
  - Centre for Flexible Manufacturing Research and Development
- McMaster University
  - Department of Mechanical Engineering
- NARMCO National Auto Radiator Manufacturing Co.
- National Institute of Magnesium Technology
- National Research Council
  - Industrial Materials Research Institute
- Northern Alberta Institute of Technology
- ORTECH International
- Pavaco Plastics Inc.
- Protrans Design Team
- Rockwell International of Canada Ltd.
- Rutenberg Design Inc.
- SKD Company
- Siemens Automotive Ltd.
  - Induction/Cooling Division
- Société de Microélectronique Industrielle de Sherbrooke Inc.
- Spectrum Engineering Corporation Ltd.
- Stelco Inc.
- TES Limited
- Uniroyal Goodrich
- University of Ottawa
- University of Toronto
  - Department of Chemical Engineering and Applied Chemistry
- University of Toronto
  - Faculty of Applied Science and Engineering
- W.R. Davis Engineering Limited
- WEGU Canada Inc.
- Weir-Jones Engineering Consultants Ltd.

Manufacturing Process Engineering

Acustar Canada Inc.
  Ajax Trim Division
Canadian General-Tower Limited
Carleton University
Carleton University
  School of Industrial Design
Centre de consultation et de formation en automatique
  et ordinique (CFAO)
Centre de recherche industrielle du Québec (CRIQ)
Centre spécialisé de technologie physique
Command Start Inc.
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Diffracto Limited
Eberhard Hardware Manufacturing Limited
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  Centre de caractérisation microscopique des matériaux
École Polytechnique de Montréal
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F.E.L. Consultants Limited
F.T. Gerson Limited
Forming Technologies Incorporated
General Kinetics Engineering Corp.
Goshen Rubber of Canada Limited
Hawtal Whiting of Canada Ltd.
Hematite Manufacturing
Hydro-Québec
  Laboratoire des technologies électrochimiques/électrotechniques
IPL Inc.
Ingenious Devices Ltd.
Ingersoll-Rand Canada Inc.
  Torrington Division
Institut d'ordinique du Québec
KVB Manufacturing
Lakehead University
  Department of Mechanical Engineering
Long Manufacturing Ltd.
METCOR Inc.
Magna International
Manufacturing Research Corporation of Ontario
McGill University
  CSIRA Steel Processing Laboratory
McGill University
  Department of Metallurgical Engineering
McMaster University
  Department of Mechanical Engineering
McMaster University
  Institute for Polymer Production
NARMCO National Auto Radiator Manufacturing Co.
National Institute of Magnesium Technology
Northern Alberta Institute of Technology
ORTECH International
Pavaco Plastics Inc.
Rockwell International of Canada Ltd.
Ryerson Polytechnical Institute
  Office of Research and Innovation
Sensor Adaptive Machines Inc. (SAMI)
Société de Microélectronique Industrielle de Sherbrooke Inc.
Stelco Inc.
Technical University of Nova Scotia
  Department of Mechanical Engineering
Uniroyal Goodrich
Université Laval
  LIPAO, Department of Chemical Engineering
University of Ottawa
University of Toronto
  Department of Chemical Engineering and Applied Chemistry
University of Toronto
  Faculty of Applied Science and Engineering
W.R. Davis Engineering Limited

Industrial Engineering

Centre de recherche industrielle du Québec (CRIQ)
Centre spécialisé de technologie physique
Eberhard Hardware Manufacturing Limited
École Polytechnique de Montréal
  Centre de caractérisation microscopique des matériaux
F.E.L. Consultants Limited
General Kinetics Engineering Corp.
Glos Engineering Ltd.
Goshen Rubber of Canada Limited
Holland College Technology Centre
IPL Inc.
KVB Manufacturing
Manufacturing Research Corporation of Ontario
McMaster University
  Centre for Flexible Manufacturing Research and Development
National Institute of Magnesium Technology
National Research Council
  Industrial Materials Research Institute
Northern Alberta Institute of Technology
ORTECH International
Pavaco Plastics Inc.
Rockwell International of Canada Ltd.
Ryerson Polytechnical Institute
  Office of Research and Innovation
Université Laval
  CERSIM
Université de Sherbrooke
  Acoustics Group (GAUS)
University of Toronto
  Department of Chemical Engineering and Applied Chemistry
University of Toronto
  Department of Mechanical Engineering, CIM Laboratory
University of Toronto
  Faculty of Applied Science and Engineering
University of Waterloo
  Institute for Improvement of Quality and Productivity
Wilson, Dario & Associates

Plant and Environmental Hazards Engineering

Centre de recherche industrielle du Québec (CRIQ)
F.E.L. Consultants Limited
Glos Engineering Ltd.
Goshen Rubber of Canada Limited
Manufacturing Research Corporation of Ontario
McMaster University
  Department of Mechanical Engineering
National Institute of Magnesium Technology
National Optics Institute
Northern Alberta Institute of Technology
ORTECH International
Stelco Inc.
Uniroyal Goodrich
Université Laval
  Department of Mechanical Engineering
University of Toronto
  Department of Chemical Engineering and Applied Chemistry
University of Toronto
  Department of Chemical Engineering and Applied Chemistry
University of Toronto
  Faculty of Applied Science and Engineering
Wilson, Dario & Associates

Testing and Evaluation

- Annectron Engineering Inc.
- Biokinetics and Associates Ltd.
- Canadian Institute of Industrial Technology
  - Division of Electrical Engineering
- Carleton University
- Cartech Consulting Services
- Centre de consultation et de formation en automatique et ordinique (CFAO)
- Centre de recherche industrielle du Québec (CRIQ)
- Composite Technological Materials Centre
- Concordia University
  - CONCAVE Research Centre
- Concordia University
  - Department of Mechanical Engineering
- DBM Reflex Entreprise Inc.
- DSMA International Inc.
- Defence and Civil Institute of Environmental Medicine
  - Biodynamics Group
- Eberhard Hardware Manufacturing Limited
- École Polytechnique de Montréal
  - Centre de caractérisation microscopique des matériaux
- F.T. Gerson Limited
- Fiberglas Canada Inc.
- Gates Power Drive Products Inc.
- General Kinetics Engineering Corp.
- Goshen Rubber of Canada Limited
- Hawtal Whiting of Canada Ltd.
- Hematite Manufacturing
- Hoemsen & Associates
- Holland College Technology Centre
- Hydro-Québec Research Institute
- IPL Inc.
- KTC Testing & Development Inc.
- Lakehead University
  - Department of Mechanical Engineering
- Long Manufacturing Ltd.
- METCOR Inc.
- Magna International
- Manufacturing Research Corporation of Ontario
- National Institute of Magnesium Technology
- National Optics Institute
- National Research Council
  - Environmental Protection Science
- National Research Council
  - Industrial Materials Research Institute
- Northern Alberta Institute of Technology
- ORTECH International
- Queen's University
  - Department of Chemistry
- Queen's University
  - Department of Metallurgical Engineering
- Rockwell International of Canada Ltd.
- Sensor Adaptive Machines Inc. (SAMI)
- Société de Microélectronique Industrielle de Sherbrooke Inc.
- Southern Alberta Institute of Technology
  - Auto-Diesel Department
- Spectrum Engineering Corporation Ltd.
- Stelco Inc.
- TAVA Corporation
- TES Limited
- The University of British Columbia
  - Department of Mechanical Engineering
- The University of Western Ontario
  - Surface Science Western
- Thermotech Engineering
- Transport Canada
  - Motor Vehicle Test Centre
- Uniroyal Goodrich
- Université Laval
  - CERSIM
- University of Ottawa
  - Department of Mechanical Engineering
- University of Ottawa
  - Electrochemical Science and Technology Centre
- University of Toronto
  - Department of Chemical Engineering and Applied Chemistry
- University of Toronto
  - Department of Chemical Engineering and Applied Chemistry
- University of Toronto
  - Department of Mechanical Engineering
- University of Toronto
  - Department of Metallurgy and Materials Science
- University of Toronto
  - Faculty of Applied Science and Engineering
- Vancouver Community College
  - Career Division
- Vehicle Systems Development Corp.
- W.R. Davis Engineering Limited
- Weir-Jones Engineering Consultants Ltd.

Vehicle Applicability

Alternate or Multifuel Vehicles

- CADMI Microelectronics/microélectronique Inc.
- Command Start Inc.
- Concordia University
  - Department of Mechanical Engineering
- DBM Reflex Entreprise Inc.
- DSMA International Inc.
- Environment Canada
  - Vehicle Emissions Test Laboratory
- Forming Technologies Incorporated
- KTC Testing & Development Inc.
- Lakehead University
  - Department of Mechanical Engineering
- MacLennan Associates
- Magna International
- McGill University
  - CSIRA Steel Processing Laboratory
- Northern Alberta Institute of Technology
- ORTECH International
- Ontario Centre for Materials Research
- Protrans Design Team
- Simon Fraser University
  - School of Engineering Science
- Southern Alberta Institute of Technology
  - Auto-Diesel Department
- TES Limited
- The University of British Columbia
  - Department of Mechanical Engineering
- The University of Western Ontario
  - Surface Science Western
- Thermotech Engineering
- Transport Canada
  - Motor Vehicle Test Centre
- Université Laval
  - LIPAO, Department of Chemical Engineering
- University of Ottawa
  - Department of Mechanical Engineering
- University of Ottawa
  - Electrochemical Science and Technology Centre
- University of Toronto
  - Department of Chemical Engineering and Applied Chemistry
- University of Toronto
  - Department of Chemical Engineering and Applied Chemistry

Alternate or Multifuel Vehicles cont'd

- University of Toronto
  - Department of Mechanical Engineering, Engine R&D Laboratory
- University of Toronto
  - Faculty of Applied Science and Engineering
- Vancouver Community College
  - Career Division
- W.R. Davis Engineering Limited

Electric or Hybrid Vehicles

- CADMI Microelectronics/microélectronique Inc.
- Centre de consultation et de formation en automatique et ordinique (CFAO)
- Centre de recherche industrielle du Québec (CRIQ)
- Composite Technological Materials Centre
- DBM Reflex Entreprise Inc.
- DSMA International Inc.
- Environment Canada
  - Vehicle Emissions Test Laboratory
- F.T. Gerson Limited
- Forming Technologies Incorporated
- Hydro-Québec
  - Laboratoire des technologies électrochimiques/électrotechniques
- Hydro-Québec Research Institute
- KTC Testing & Development Inc.
- Lakehead University
  - Department of Mechanical Engineering
- MacLennan Associates
- Magna International
- McGill University
  - CSIRA Steel Processing Laboratory
- Northern Alberta Institute of Technology
- ORTECH International
- Ontario Centre for Materials Research
- Protrans Design Team
- Rutenberg Design Inc.
- TES Limited
- The University of British Columbia
  - Department of Electrical Engineering
- The University of Western Ontario
  - Surface Science Western
- Transport Canada
  - Motor Vehicle Test Centre
- Université Laval
  - LIPAO, Department of Chemical Engineering
- University of Ottawa
- University of Ottawa
  - Department of Mechanical Engineering
- University of Ottawa
  - Electrochemical Science and Technology Centre
- University of Toronto
  - Department of Chemical Engineering and Applied Chemistry
- University of Toronto
  - Faculty of Applied Science and Engineering
- W.R. Davis Engineering Limited

Cars and Multi Purpose Vehicles

- Acustar Canada Inc.
  - Ajax Trim Division
- Annectron Engineering Inc.
- CADMI Microelectronics/microélectronique Inc.
- Canadian General-Tower Limited
- Carleton University
  - School of Industrial Design
- Command Start Inc.
- Composite Technological Materials Centre
- Concordia University
  - CONCAVE Research Centre
- Concordia University
  - Department of Mechanical Engineering
- DBM Reflex Entreprise Inc.
- DSMA International Inc.
- Defence and Civil Institute of Environmental Medicine
  - Biodynamics Group
- Eberhard Hardware Manufacturing Limited
- F.T. Gerson Limited
- Fiberglas Canada Inc.
- Forming Technologies Incorporated
- Gad Shaanan Designs Inc.
- Gates Power Drive Products Inc.
- Goshen Rubber of Canada Limited
- Hawtal Whiting of Canada Ltd.
- Hematite Manufacturing
- IPL Inc.
- Ingenious Devices Ltd.
- Ingersoll-Rand Canada Inc.
  - Torrington Division
- KTC Testing & Development Inc.
- Lakehead University
  - Department of Mechanical Engineering
- Long Manufacturing Ltd.
- METCOR Inc.
- MacLennan Associates
- Magna International
- McGill University
  - CSIRA Steel Processing Laboratory
- McMaster University
  - Centre for Flexible Manufacturing Research and Development
- NARMCO National Auto Radiator Manufacturing Co.
- National Institute of Magnesium Technology
- National Optics Institute
- National Research Council
  - Environmental Protection Science
- National Research Council
  - Industrial Materials Research Institute
- Northern Alberta Institute of Technology
- ORTECH International
- Ontario Centre for Materials Research
- Pavaco Plastics Inc.
- Protrans Design Team
- Queen's University
  - Department of Mechanical Engineering
- Rockwell International of Canada Ltd.
- SKD Company
- Sensor Adaptive Machines Inc. (SAMI)
- Siemens Automotive Ltd.
  - Induction/Cooling Division
- Southern Alberta Institute of Technology
  - Auto-Diesel Department
- TES Limited
- The University of British Columbia
  - Department of Mechanical Engineering
- The University of Western Ontario
  - Surface Science Western
- Thermotech Engineering
- Transport Canada
  - Motor Vehicle Test Centre
- Uniroyal Goodrich
- Université Laval
  - LIPAO, Department of Chemical Engineering
- Université de Sherbrooke
  - Acoustics Group (GAUS)
- University of Ottawa

Cars and Multi Purpose Vehicles cont'd

University of Toronto
  Department of Chemical Engineering and Applied Chemistry
University of Toronto
  Department of Mechanical Engineering
University of Toronto
  Faculty of Applied Science and Engineering
Vancouver Community College
  Career Division
W.R. Davis Engineering Limited
WEGU Canada Inc.
Weir-Jones Engineering Consultants Ltd.

Off-Road Vehicles

Biokinetics and Associates Ltd.
CADMI Microelectronics/microélectronique Inc.
Carleton University
Carleton University
  School of Industrial Design
Cartech Consulting Services
Centre de recherche industrielle du Québec (CRIQ)
Composite Technological Materials Centre
Concordia University
  CONCAVE Research Centre
Concordia University
  Department of Mechanical Engineering
DBM Reflex Entreprise Inc.
DSMA International Inc.
Environment Canada
  Vehicle Emissions Test Laboratory
F.T. Gerson Limited
Fiberglas Canada Inc.
Forming Technologies Incorporated
Gad Shaanan Designs Inc.
General Kinetics Engineering Corp.
Goshen Rubber of Canada Limited
Hoemsen & Associates
KTC Testing & Development Inc.
Lakehead University
  Department of Mechanical Engineering
Long Manufacturing Ltd.
METCOR Inc.
MacLennan Associates
McGill University
  CSIRA Steel Processing Laboratory
NARMCO National Auto Radiator Manufacturing Co.
National Institute of Magnesium Technology
National Research Council
  Industrial Materials Research Institute
Northern Alberta Institute of Technology
ORTECH International
Ontario Centre for Materials Research
Protrans Design Team
Queen's University
  Department of Mechanical Engineering
TES Limited
The University of Western Ontario
  Surface Science Western
Transport Canada
  Motor Vehicle Test Centre
Université Laval
  Department of Mechanical Engineering
Université Laval
  LIPAO, Department of Chemical Engineering
University of Toronto
  Department of Chemical Engineering and Applied Chemistry
University of Toronto
  Department of Mechanical Engineering
University of Toronto
  Faculty of Applied Science and Engineering
Vancouver Community College
  Career Division
Vehicle Systems Development Corp.
W.R. Davis Engineering Limited
Weir-Jones Engineering Consultants Ltd.

Trucks and Buses

Annectron Engineering Inc.
CADMI Microelectronics/microélectronique Inc.
Canadian General-Tower Limited
Carleton University
  School of Industrial Design
Cartech Consulting Services
Centre de consultation et de formation en automatique
  et organique (CFAO)
Centre de recherche industrielle du Québec (CRIQ)
Command Start Inc.
Composite Technological Materials Centre
Concordia University
  CONCAVE Research Centre
Concordia University
  Department of Mechanical Engineering
DBM Reflex Entreprise Inc.
DSMA International Inc.
Eberhard Hardware Manufacturing Limited
Environment Canada
  Vehicle Emissions Test Laboratory
F.T. Gerson Limited
Fiberglas Canada Inc.
Forming Technologies Incorporated
Gad Shaanan Designs Inc.
Gates Power Drive Products Inc.
General Kinetics Engineering Corp.
Global Sensor Systems Inc.
Hawtal Whiting of Canada Ltd.
Hoemsen & Associates
IPL Inc.
KTC Testing & Development Inc.
Lakehead University
  Department of Mechanical Engineering
Long Manufacturing Ltd.
MacLennan Associates
McGill University
  CSIRA Steel Processing Laboratory
NARMCO National Auto Radiator Manufacturing Co.
National Optics Institute
National Research Council
  Industrial Materials Research Institute
Northern Alberta Institute of Technology
ORTECH International
Ontario Centre for Materials Research
Pavaco Plastics Inc.
Protrans Design Team
Queen's University
  Department of Mechanical Engineering
Rutenberg Design Inc.
SKD Company
Siemens Automotive Ltd.
  Induction/Cooling Division
TES Limited
The University of British Columbia
  Department of Mechanical Engineering
The University of Western Ontario
  Surface Science Western
Transport Canada
  Motor Vehicle Test Centre

Trucks and Buses cont'd

- Université Laval
  - LIPAO, Department of Chemical Engineering
- Université de Sherbrooke
  - Acoustics Group (GAUS)
- University of Ottawa
- University of Toronto
  - Department of Chemical Engineering and Applied Chemistry
- University of Toronto
  - Department of Mechanical Engineering
- University of Toronto
  - Faculty of Applied Science and Engineering
- Vancouver Community College
  - Career Division
- Vehicle Systems Development Corp.
- W.R. Davis Engineering Limited
- Weir-Jones Engineering Consultants Ltd.

Specialty and Other Vehicles

- Biokinetics and Associates Ltd.
- CADMI Microelectronics/microélectronique Inc.
- Carleton University
  - School of Industrial Design
- Cartech Consulting Services
- Centre de consultation et de formation en automatique et ordinique (CFAO)
- Centre de recherche industrielle du Québec (CRIQ)
- Concordia University
  - CONCAVE Research Centre
- DBM Reflex Entreprise Inc.
- DSMA International Inc.
- F.T. Gerson Limited
- Fiberglas Canada Inc.
- Forming Technologies Incorporated
- Gad Shaanan Designs Inc.
- General Kinetics Engineering Corp.
- Hawtal Whiting of Canada Ltd.
- Hoemsen & Associates
- Hugh Macmillan Rehabilitation Centre
  - Rehabilitation Engineering
- KTC Testing & Development Inc.
- KVB Manufacturing
- Lakehead University
  - Department of Mechanical Engineering
- Long Manufacturing Ltd.
- MacLennan Associates
- McGill University
  - CSIRA Steel Processing Laboratory
- National Research Council
  - Industrial Materials Research Institute
- Northern Alberta Institute of Technology
- ORTECH International
- Ontario Centre for Materials Research
- Protrans Design Team
- Queen's University
  - Department of Mechanical Engineering
- Rutenberg Design Inc.
- Spectrum Engineering Corporation Ltd.
- TES Limited
- The University of British Columbia
  - Department of Electrical Engineering
- The University of Western Ontario
  - Surface Science Western
- Transport Canada
  - Motor Vehicle Test Centre
- Université Laval
  - LIPAO, Department of Chemical Engineering
- University of Ottawa
  - Electrochemical Science and Technology Centre
- University of Toronto
  - Department of Chemical Engineering and Applied Chemistry
- University of Toronto
  - Department of Mechanical Engineering
- University of Toronto
  - Faculty of Applied Science and Engineering
- Vehicle Systems Development Corp.
- W.R. Davis Engineering Limited

Manufacturing Process Expertise

Metal Manufacturing Processes

- Acustar Canada Inc.
  - Ajax Trim Division
- Annectron Engineering Inc.
- Carleton University
- Carleton University
  - School of Industrial Design
- Cartech Consulting Services
- Centre de consultation et de formation en automatique et ordinique (CFAO)
- Centre de recherche industrielle du Québec (CRIQ)
- DBM Reflex Entreprise Inc.
- DSMA International Inc.
- Eberhard Hardware Manufacturing Limited
- École Polytechnique de Montréal
- École Polytechnique de Montréal
  - Centre de caractérisation microscopique des matériaux
- F.T. Gerson Limited
- Forming Technologies Incorporated
- Gad Shaanan Designs Inc.
- Gates Power Drive Products Inc.
- General Kinetics Engineering Corp.
- Glos Engineering Ltd.
- Goshen Rubber of Canada Limited
- Hydro-Québec
  - Laboratoire des technologies électrochimiques/électrotechniques
- Ingersoll-Rand Canada Inc.
  - Torrington Division
- Long Manufacturing Ltd.
- METCOR Inc.
- MacLennan Associates
- Magna International
- Manufacturing Research Corporation of Ontario
- McGill University
  - CSIRA Steel Processing Laboratory
- McGill University
  - Department of Metallurgical Engineering
- McMaster University
  - Department of Mechanical Engineering
- NARMCO National Auto Radiator Manufacturing Co.
- National Institute of Magnesium Technology
- National Research Council
  - Industrial Materials Research Institute
- Northern Alberta Institute of Technology
- ORTECH International
- Queen's University
  - Department of Metallurgical Engineering
- Rockwell International of Canada Ltd.
- Ryerson Polytechnical Institute
  - Office of Research and Innovation
- SKD Company
- Sambrook & Hermetz Industrial Designers
- Siemens Automotive Ltd.
  - Induction/Cooling Division

Metal Manufacturing Processes cont'd

Southern Alberta Institute of Technology
  Auto-Diesel Department
Spectrum Engineering Corporation Ltd.
Stelco Inc.
Uniroyal Goodrich
University of Ottawa
University of Toronto
  Department of Chemical Engineering and Applied Chemistry
University of Toronto
  Department of Mechanical Engineering, CIM Laboratory
W.R. Davis Engineering Limited

Plastics or Composites Manufacturing Processes

Acustar Canada Inc.
  Ajax Trim Division
Annectron Engineering Inc.
Biokinetics and Associates Ltd.
Carleton University
  School of Industrial Design
Centre de consultation et de formation en automatique
  et ordinique (CFAO)
Centre de recherche industrielle du Québec (CRIQ)
Composite Technological Materials Centre
Concordia University
  Department of Mechanical Engineering
DBM Reflex Entreprise Inc.
DSMA International Inc.
École Polytechnique de Montréal
  Centre de caractérisation microscopique des matériaux
École Polytechnique de Montréal
  Centre de recherche appliquée sur les polymères (CRASP)
F.T. Gerson Limited
Fiberglas Canada Inc.
Gad Shaanan Designs Inc.
Gates Power Drive Products Inc.
Glos Engineering Ltd.
Goshen Rubber of Canada Limited
Hematite Manufacturing
Hydro-Québec
  Laboratoire des technologies électrochimiques/électrotechniques
IPL Inc.
KTC Testing & Development Inc.
Long Manufacturing Ltd.
MacLennan Associates
Magna International
Manufacturing Research Corporation of Ontario
McMaster University
  Department of Mechanical Engineering
McMaster University
  Institute for Polymer Production
National Research Council
  Environmental Protection Science
National Research Council
  Industrial Materials Research Institute
Northern Alberta Institute of Technology
ORTECH International
Pavaco Plastics Inc.
Queen's University
  Department of Chemistry
Rockwell International of Canada Ltd.
Ryerson Polytechnical Institute
  Office of Research and Innovation
Sambrook & Hermetz Industrial Designers
Siemens Automotive Ltd.
  Induction/Cooling Division
Southern Alberta Institute of Technology
  Auto-Diesel Department
Spectrum Engineering Corporation Ltd.
Stelco Inc.
Université Laval
  CERSIM
Université Laval
  LIPAO, Department of Chemical Engineering
University of Ottawa
University of Toronto
  Department of Chemical Engineering and Applied Chemistry
University of Toronto
  Department of Chemical Engineering and Applied Chemistry
WEGU Canada Inc.
Weir-Jones Engineering Consultants Ltd.

Machinery and Equipment for Manufacturing

Acustar Canada Inc.
  Ajax Trim Division
Annectron Engineering Inc.
Biokinetics and Associates Ltd.
Carleton University
  School of Industrial Design
Cartech Consulting Services
Centre de consultation et de formation en automatique
  et ordinique (CFAO)
Centre de recherche industrielle du Québec (CRIQ)
Centre spécialisé de technologie physique
DBM Reflex Entreprise Inc.
DSMA International Inc.
Diffracto Limited
Eberhard Hardware Manufacturing Limited
École Polytechnique de Montréal
École Polytechnique de Montréal
  Centre de caractérisation microscopique des matériaux
F.T. Gerson Limited
Gad Shaanan Designs Inc.
General Kinetics Engineering Corp.
Glos Engineering Ltd.
Goshen Rubber of Canada Limited
Hydro-Québec
  Laboratoire des technologies électrochimiques/électrotechniques
Ingenious Devices Ltd.
Ingersoll-Rand Canada Inc.
  Torrington Division
KTC Testing & Development Inc.
Long Manufacturing Ltd.
MacLennan Associates
Magna International
Manufacturing Research Corporation of Ontario
McMaster University
  Centre for Flexible Manufacturing Research and Development
McMaster University
  Department of Mechanical Engineering
NARMCO National Auto Radiator Manufacturing Co.
National Institute of Magnesium Technology
Northern Alberta Institute of Technology
ORTECH International
Pavaco Plastics Inc.
Queen's University
  Department of Mechanical Engineering
Rockwell International of Canada Ltd.
Ryerson Polytechnical Institute
  Office of Research and Innovation
Sensor Adaptive Machines Inc. (SAMI)
Southern Alberta Institute of Technology
  Auto-Diesel Department
Spectrum Engineering Corporation Ltd.
Stelco Inc.
Uniroyal Goodrich

Machinery and Equipment for Manufacturing cont'd

University of Ottawa
University of Toronto
  Department of Chemical Engineering and Applied Chemistry
W.R. Davis Engineering Limited
Weir-Jones Engineering Consultants Ltd.
Wilson, Dario & Associates

Robotics

Acustar Canada Inc.
  Ajax Trim Division
Biokinetics and Associates Ltd.
CADMI Microelectronics/microélectronique Inc.
Canadian Institute of Industrial Technology
  Division of Electrical Engineering
Carleton University
Carleton University
  School of Industrial Design
Centre de consultation et de formation en automatique et ordinique (CFAO)
Centre de recherche industrielle du Québec (CRIQ)
Centre spécialisé de technologie physique
Concordia University
  Department of Mechanical Engineering
DSMA International Inc.
Diffracto Limited
Eberhard Hardware Manufacturing Limited
École Polytechnique de Montréal
General Kinetics Engineering Corp.
Glos Engineering Ltd.
Goshen Rubber of Canada Limited
IPL Inc.
Ingenious Devices Ltd.
Ingersoll-Rand Canada Inc.
  Torrington Division
Institut d'ordinique du Québec
Long Manufacturing Ltd.
MacLennan Associates
Magna International
Manufacturing Research Corporation of Ontario
McMaster University
  Centre for Flexible Manufacturing Research and Development
McMaster University
  Department of Mechanical Engineering
National Institute of Magnesium Technology
National Optics Institute
National Research Council
  Industrial Materials Research Institute
Northern Alberta Institute of Technology
ORTECH International
Pavaco Plastics Inc.
Queen's University
  Department of Mechanical Engineering
Rockwell International of Canada Ltd.
Ryerson Polytechnical Institute
  Office of Research and Innovation
SKD Company
Sensor Adaptive Machines Inc. (SAMI)
Southern Alberta Institute of Technology
  Auto-Diesel Department
Spectrum Engineering Corporation Ltd.
Stelco Inc.
Uniroyal Goodrich
University of New Brunswick
  Manufacturing Technology Centre
University of Ottawa
University of Toronto
  Department of Chemical Engineering and Applied Chemistry
University of Toronto
  Department of Mechanical Engineering, CIM Laboratory
University of Toronto
  Department of Mechanical Engineering, Robotics and Automation Laboratory
University of Toronto
  Faculty of Applied Science and Engineering
W.R. Davis Engineering Limited

Other Manufacturing Process Expertise

Carleton University
  School of Industrial Design
DSMA International Inc.
École Polytechnique de Montréal
F.T. Gerson Limited
Forming Technologies Incorporated
Goshen Rubber of Canada Limited
Hematite Manufacturing
IPL Inc.
KVB Manufacturing
Manufacturing Research Corporation of Ontario
McMaster University
  Centre for Flexible Manufacturing Research and Development
NARMCO National Auto Radiator Manufacturing Co.
Northern Alberta Institute of Technology
Pavaco Plastics Inc.
Ryerson Polytechnical Institute
  Office of Research and Innovation
Uniroyal Goodrich
Université Laval
  Department of Mechanical Engineering
University of Ottawa
University of Ottawa
  Electrochemical Science and Technology Centre
University of Toronto
  Department of Chemical Engineering and Applied Chemistry
WEGU Canada Inc.

Technical Areas of Expertise

Aerodynamics and Fluid Mechanics

Annectron Engineering Inc.
Biokinetics and Associates Ltd.
Carleton University
Cartech Consulting Services
Centre de consultation et de formation en automatique et ordinique (CFAO)
Centre de recherche industrielle du Québec (CRIQ)
Concordia University
  Department of Mechanical Engineering
DSMA International Inc.
Eberhard Hardware Manufacturing Limited
École Polytechnique de Montréal
General Kinetics Engineering Corp.
Glos Engineering Ltd.
Goshen Rubber of Canada Limited
Holland College Technology Centre
KTC Testing & Development Inc.
Lakehead University
  Department of Mechanical Engineering
Long Manufacturing Ltd.
MacLennan Associates
Manufacturing Research Corporation of Ontario
McMaster University
  Department of Mechanical Engineering
National Institute of Magnesium Technology
Northern Alberta Institute of Technology
ORTECH International

Queen's University
  Department of Mechanical Engineering
Rockwell International of Canada Ltd.
Ryerson Polytechnical Institute
  Office of Research and Innovation
Siemens Automotive Ltd.
  Induction/Cooling Division
Southern Alberta Institute of Technology
  Auto-Diesel Department
Spectrum Engineering Corporation Ltd.
Stelco Inc.
TES Limited
Technical University of Nova Scotia
  Department of Mechanical Engineering
The University of British Columbia
  Department of Mechanical Engineering
Université Laval
  Department of Mechanical Engineering
Université Laval
  LIPAO, Department of Chemical Engineering
University of Ottawa
University of Ottawa
  Electrochemical Science and Technology Centre
University of Toronto
  Department of Chemical Engineering and Applied Chemistry
University of Toronto
  Department of Chemical Engineering and Applied Chemistry
University of Toronto
  Department of Mechanical Engineering
University of Toronto
  Faculty of Applied Science and Engineering
University of Toronto
  Institute of Aerospace Studies
W.R. Davis Engineering Limited
Wilson, Dario & Associates

CAD, CAM, CIM

Acustar Canada Inc.
  Ajax Trim Division
Annectron Engineering Inc.
Biokinetics and Associates Ltd.
CADMI Microelectronics/microélectronique Inc.
Canadian Institute of Industrial Technology
  Division of Electrical Engineering
Carleton University
Carleton University
  School of Industrial Design
Cartech Consulting Services
Centre de consultation et de formation en automatique
  et ordinique (CFAO)
Centre de recherche industrielle du Québec (CRIQ)
Centre spécialisé de technologie physique
Command Start Inc.
Composite Technological Materials Centre
Concordia University
  CONCAVE Research Centre
Concordia University
  Department of Mechanical Engineering
DBM Reflex Entreprise Inc.
DSMA International Inc.
Eberhard Hardware Manufacturing Limited
École Polytechnique de Montréal
Forming Technologies Incorporated
Gates Power Drive Products Inc.
General Kinetics Engineering Corp.
Glos Engineering Ltd.
Goshen Rubber of Canada Limited
Hawtal Whiting of Canada Ltd.
Hematite Manufacturing
Hoemsen & Associates
Holland College Technology Centre
IPL Inc.
Ingersoll-Rand Canada Inc.
  Torrington Division
Institut d'ordinique du Québec
KTC Testing & Development Inc.
Lakehead University
  Department of Mechanical Engineering
Long Manufacturing Ltd.
MacLennan Associates
Magna International
Manufacturing Research Corporation of Ontario
McMaster University
  Centre for Flexible Manufacturing Research and Development
McMaster University
  Department of Mechanical Engineering
NARMCO National Auto Radiator Manufacturing Co.
National Institute of Magnesium Technology
National Research Council
  Industrial Materials Research Institute
Northern Alberta Institute of Technology
ORTECH International
Pavaco Plastics Inc.
Protrans Design Team
Queen's University
  Department of Mechanical Engineering
Rockwell International of Canada Ltd.
Ryerson Polytechnical Institute
  Office of Research and Innovation
SKD Company
Sambrook & Hermetz Industrial Designers
Sensor Adaptive Machines Inc. (SAMI)
Siemens Automotive Ltd.
  Induction/Cooling Division
Simon Fraser University
  School of Engineering Science
Société de Microélectronique Industrielle de Sherbrooke Inc.
Southern Alberta Institute of Technology
  Auto-Diesel Department
Spectrum Engineering Corporation Ltd.
Stelco Inc.
TAVA Corporation
TES Limited
Technical University of Nova Scotia
  Department of Mechanical Engineering
Uniroyal Goodrich
Université Laval
  CERSIM
University of New Brunswick
  Manufacturing Technology Centre
University of Ottawa
University of Ottawa
  Electrochemical Science and Technology Centre
University of Toronto
  Department of Chemical Engineering and Applied Chemistry
University of Toronto
  Department of Chemical Engineering and Applied Chemistry
University of Toronto
  Department of Mechanical Engineering, CIM Laboratory
University of Toronto
  Department of Metallurgy and Materials Science
University of Toronto
  Department of Mechanical Engineering, Robotics and
  Automation Laboratory

University of Toronto
  Faculty of Applied Science and Engineering
Vehicle Systems Development Corp.
W.R. Davis Engineering Limited
WEGU Canada Inc.
Wilson, Dario & Associates

Finite Element Analysis

Acustar Canada Inc.
  Ajax Trim Division
Annectron Engineering Inc.
Biokinetics and Associates Ltd.
Carleton University
Cartech Consulting Services
Centre de consultation et de formation en automatique et ordinique (CFAO)
Centre de recherche industrielle du Québec (CRIQ)
Composite Technological Materials Centre
Concordia University
  CONCAVE Research Centre
Concordia University
  Department of Mechanical Engineering
Concordia University
  Science Industrial Research Unit
DBM Reflex Entreprise Inc.
DSMA International Inc.
École Polytechnique de Montréal
  Centre de recherche appliquée sur les polymères (CRASP)
Forming Technologies Incorporated
Gates Power Drive Products Inc.
Glos Engineering Ltd.
Hawtal Whiting of Canada Ltd.
Hoemsen & Associates
Hydro-Québec Research Institute
IPL Inc.
Lakehead University
  Department of Mechanical Engineering
Long Manufacturing Ltd.
MacLennan Associates
Magna International
Manufacturing Research Corporation of Ontario
McGill University
  Department of Metallurgical Engineering
McMaster University
  Centre for Flexible Manufacturing Research and Development
McMaster University
  Department of Mechanical Engineering
McMaster University
  Institute for Polymer Production
National Institute of Magnesium Technology
National Research Council
  Industrial Materials Research Institute
Northern Alberta Institute of Technology
ORTECH International
Ontario Centre for Materials Research
Queen's University
  Department of Mechanical Engineering
Queen's University
  Department of Metallurgical Engineering
Rockwell International of Canada Ltd.
Ryerson Polytechnical Institute
  Office of Research and Innovation
Simon Fraser University
  School of Engineering Science
Southern Alberta Institute of Technology
  Auto-Diesel Department
Spectrum Engineering Corporation Ltd.
Stelco Inc.
TES Limited
Technical University of Nova Scotia
  Department of Mechanical Engineering
Université Laval
  CERSIM
Université Laval
  LIPAO, Department of Chemical Engineering
University of New Brunswick
  Manufacturing Technology Centre
University of Ottawa
University of Ottawa
  Electrochemical Science and Technology Centre
University of Toronto
  Department of Chemical Engineering and Applied Chemistry
University of Toronto
  Department of Chemical Engineering and Applied Chemistry
University of Toronto
  Department of Mechanical Engineering
University of Toronto
  Department of Metallurgy and Materials Science
University of Toronto
  Faculty of Applied Science and Engineering
University of Toronto
  Institute of Aerospace Studies
Vehicle Systems Development Corp.
W.R. Davis Engineering Limited
Weir-Jones Engineering Consultants Ltd.

Fuels and Lubricants

Annectron Engineering Inc.
Biokinetics and Associates Ltd.
Cartech Consulting Services
Centre de recherche industrielle du Québec (CRIQ)
Concordia University
  Department of Mechanical Engineering
DSMA International Inc.
Eberhard Hardware Manufacturing Limited
École Polytechnique de Montréal
General Kinetics Engineering Corp.
Glos Engineering Ltd.
Hoemsen & Associates
Hydro-Québec Research Institute
KTC Testing & Development Inc.
Long Manufacturing Ltd.
MacLennan Associates
Manufacturing Research Corporation of Ontario
McMaster University
  Department of Mechanical Engineering
NARMCO National Auto Radiator Manufacturing Co.
Northern Alberta Institute of Technology
ORTECH International
Rockwell International of Canada Ltd.
Ryerson Polytechnical Institute
  Office of Research and Innovation
Southern Alberta Institute of Technology
  Auto-Diesel Department
Spectrum Engineering Corporation Ltd.
Stelco Inc.
TES Limited
Technical University of Nova Scotia
  Department of Mechanical Engineering
The University of British Columbia
  Department of Mechanical Engineering
Thermotech Engineering
University of Ottawa
University of Ottawa
  Electrochemical Science and Technology Centre

Fuels and Lubricants cont'd

University of Toronto
  Department of Chemical Engineering and Applied Chemistry
University of Toronto
  Department of Chemical Engineering and Applied Chemistry
University of Toronto
  Department of Mechanical Engineering, Engine R&D Laboratory
University of Toronto
  Faculty of Applied Science and Engineering
Vancouver Community College
  Career Division
W.R. Davis Engineering Limited

Ergonomics or Industrial Design

Acustar Canada Inc.
  Ajax Trim Division
Annectron Engineering Inc.
Biokinetics and Associates Ltd.
Carleton University
Carleton University
  School of Industrial Design
Cartech Consulting Services
Centre de consultation et de formation en automatique et ordinique (CFAO)
Centre de recherche industrielle du Québec (CRIQ)
Centre spécialisé de technologie physique
Composite Technological Materials Centre
Concordia University
  CONCAVE Research Centre
DSMA International Inc.
Eberhard Hardware Manufacturing Limited
F.T. Gerson Limited
Gad Shaanan Designs Inc.
Glos Engineering Ltd.
Goshen Rubber of Canada Limited
Hoemsen & Associates
IPL Inc.
Ingersoll-Rand Canada Inc.
  Torrington Division
KTC Testing & Development Inc.
KVB Manufacturing
Long Manufacturing Ltd.
MacLennan Associates
Manufacturing Research Corporation of Ontario
McMaster University
  Centre for Flexible Manufacturing Research and Development
McMaster University
  Department of Mechanical Engineering
National Institute of Magnesium Technology
National Research Council
  Industrial Materials Research Institute
Northern Alberta Institute of Technology
ORTECH International
Protrans Design Team
Queen's University
  Department of Mechanical Engineering
Rockwell International of Canada Ltd.
Rutenberg Design Inc.
Ryerson Polytechnical Institute
  Office of Research and Innovation
Sambrook & Hermetz Industrial Designers
Spectrum Engineering Corporation Ltd.
Stelco Inc.
TES Limited
University of Ottawa
University of Ottawa
  Electrochemical Science and Technology Centre
University of Toronto
  Department of Chemical Engineering and Applied Chemistry
University of Toronto
  Faculty of Applied Science and Engineering
W.R. Davis Engineering Limited

Joining and Fastening

Annectron Engineering Inc.
Biokinetics and Associates Ltd.
Carleton University
Carleton University
  School of Industrial Design
Cartech Consulting Services
Centre de recherche industrielle du Québec (CRIQ)
Composite Technological Materials Centre
DSMA International Inc.
Eberhard Hardware Manufacturing Limited
F.T. Gerson Limited
Gates Power Drive Products Inc.
General Kinetics Engineering Corp.
Goshen Rubber of Canada Limited
Hoemsen & Associates
KTC Testing & Development Inc.
Lakehead University
  Department of Mechanical Engineering
Long Manufacturing Ltd.
MacLennan Associates
Manufacturing Research Corporation of Ontario
McGill University
  Department of Metallurgical Engineering
National Institute of Magnesium Technology
National Research Council
  Industrial Materials Research Institute
Northern Alberta Institute of Technology
ORTECH International
Ontario Centre for Materials Research
Pavaco Plastics Inc.
Queen's University
  Department of Mechanical Engineering
Rockwell International of Canada Ltd.
Ryerson Polytechnical Institute
  Office of Research and Innovation
Sensor Adaptive Machines Inc. (SAMI)
Spectrum Engineering Corporation Ltd.
Stelco Inc.
TES Limited
Uniroyal Goodrich
University of Ottawa
University of Ottawa
  Electrochemical Science and Technology Centre
University of Toronto
  Department of Chemical Engineering and Applied Chemistry
University of Toronto
  Department of Chemical Engineering and Applied Chemistry
University of Toronto
  Department of Mechanical Engineering
University of Toronto
  Department of Metallurgy and Materials Science
University of Toronto
  Faculty of Applied Science and Engineering
Vancouver Community College
  Career Division

Ferrous Metals

Annectron Engineering Inc.
Biokinetics and Associates Ltd.
Carleton University
  School of Industrial Design

Ferrous Metals cont'd

- Cartech Consulting Services
- Centre de recherche industrielle du Québec (CRIQ)
- Concordia University
  - CONCAVE Research Centre
- Concordia University
  - Science Industrial Research Unit
- DSMA International Inc.
- Eberhard Hardware Manufacturing Limited
- École Polytechnique de Montréal
  - Centre de caractérisation microscopique des matériaux
- F.T. Gerson Limited
- Forming Technologies Incorporated
- Gad Shaanan Designs Inc.
- Gates Power Drive Products Inc.
- General Kinetics Engineering Corp.
- Glos Engineering Ltd.
- Hoemsen & Associates
- Ingersoll-Rand Canada Inc.
  - Torrington Division
- KTC Testing & Development Inc.
- Lakehead University
  - Department of Mechanical Engineering
- Long Manufacturing Ltd.
- METCOR Inc.
- MacLennan Associates
- Magna International
- Manufacturing Research Corporation of Ontario
- McGill University
  - CSIRA Steel Processing Laboratory
- McGill University
  - Department of Metallurgical Engineering
- McMaster University
  - Centre for Flexible Manufacturing Research and Development
- McMaster University
  - Department of Mechanical Engineering
- NARMCO National Auto Radiator Manufacturing Co.
- National Research Council
  - Industrial Materials Research Institute
- Northern Alberta Institute of Technology
- ORTECH International
- Ontario Centre for Materials Research
- Protrans Design Team
- Queen's University
  - Department of Metallurgical Engineering
- Rockwell International of Canada Ltd.
- Ryerson Polytechnical Institute
  - Office of Research and Innovation
- SKD Company
- Sambrook & Hermetz Industrial Designers
- Sensor Adaptive Machines Inc. (SAMI)
- Southern Alberta Institute of Technology
  - Auto-Diesel Department
- Spectrum Engineering Corporation Ltd.
- Stelco Inc.
- TES Limited
- The University of Western Ontario
  - Surface Science Western
- Uniroyal Goodrich
- University of Ottawa
- University of Ottawa
  - Electrochemical Science and Technology Centre
- University of Toronto
  - Department of Chemical Engineering and Applied Chemistry
- University of Toronto
  - Department of Mechanical Engineering
- University of Toronto
  - Department of Metallurgy and Materials Science
- University of Toronto
  - Faculty of Applied Science and Engineering
- W.R. Davis Engineering Limited
- Wilson, Dario & Associates

Non-Ferrous Metals

- Annectron Engineering Inc.
- Biokinetics and Associates Ltd.
- Carleton University
  - School of Industrial Design
- Cartech Consulting Services
- Centre de recherche industrielle du Québec (CRIQ)
- Concordia University
  - Science Industrial Research Unit
- DSMA International Inc.
- Eberhard Hardware Manufacturing Limited
- École Polytechnique de Montréal
- École Polytechnique de Montréal
  - Centre de caractérisation microscopique des matériaux
- F.T. Gerson Limited
- Gad Shaanan Designs Inc.
- Gates Power Drive Products Inc.
- General Kinetics Engineering Corp.
- Glos Engineering Ltd.
- Hoemsen & Associates
- Hydro-Québec
  - Laboratoire des technologies électrochimiques/électrotechniques
- Hydro-Québec Research Institute
- KTC Testing & Development Inc.
- Lakehead University
  - Department of Mechanical Engineering
- Long Manufacturing Ltd.
- METCOR Inc.
- MacLennan Associates
- Magna International
- Manufacturing Research Corporation of Ontario
- McGill University
  - CSIRA Steel Processing Laboratory
- McGill University
  - Department of Metallurgical Engineering
- McMaster University
  - Department of Mechanical Engineering
- National Institute of Magnesium Technology
- National Research Council
  - Industrial Materials Research Institute
- Northern Alberta Institute of Technology
- ORTECH International
- Ontario Centre for Materials Research
- Protrans Design Team
- Queen's University
  - Department of Metallurgical Engineering
- Rockwell International of Canada Ltd.
- Ryerson Polytechnical Institute
  - Office of Research and Innovation
- Sambrook & Hermetz Industrial Designers
- Southern Alberta Institute of Technology
  - Auto-Diesel Department
- Spectrum Engineering Corporation Ltd.
- Stelco Inc.
- TES Limited
- The University of Western Ontario
  - Surface Science Western
- Uniroyal Goodrich
- University of Ottawa
- University of Ottawa
  - Electrochemical Science and Technology Centre
- University of Toronto
  - Department of Chemical Engineering and Applied Chemistry

Non-Ferrous Metals cont'd

- University of Toronto
  - Department of Chemical Engineering and Applied Chemistry
- University of Toronto
  - Department of Metallurgy and Materials Science
- University of Toronto
  - Faculty of Applied Science and Engineering
- W.R. Davis Engineering Limited
- Wilson, Dario & Associates

Plastics

- Acustar Canada Inc.
  - Ajax Trim Division
- Annectron Engineering Inc.
- Biokinetics and Associates Ltd.
- Canadian General-Tower Limited
- Carleton University
  - School of Industrial Design
- Centre de recherche industrielle du Québec (CRIQ)
- Composite Technological Materials Centre
- Concordia University
  - Science Industrial Research Unit
- DBM Reflex Entreprise Inc.
- DSMA International Inc.
- Eberhard Hardware Manufacturing Limited
- École Polytechnique de Montréal
- École Polytechnique de Montréal
  - Centre de caractérisation microscopique des matériaux
- École Polytechnique de Montréal
  - Centre de recherche appliquée sur les polymères (CRASP)
- F.T. Gerson Limited
- Fiberglas Canada Inc.
- Gad Shaanan Designs Inc.
- Gates Power Drive Products Inc.
- General Kinetics Engineering Corp.
- Glos Engineering Ltd.
- Goshen Rubber of Canada Limited
- Hematite Manufacturing
- Hoemsen & Associates
- Hydro-Québec
  - Laboratoire des technologies électrochimiques/électrotechniques
- Hydro-Québec Research Institute
- IPL Inc.
- KTC Testing & Development Inc.
- Lakehead University
  - Department of Mechanical Engineering
- Long Manufacturing Ltd.
- MacLennan Associates
- Magna International
- Manufacturing Research Corporation of Ontario
- McMaster University
  - Department of Mechanical Engineering
- McMaster University
  - Institute for Polymer Production
- National Research Council
  - Environmental Protection Science
- National Research Council
  - Industrial Materials Research Institute
- Northern Alberta Institute of Technology
- ORTECH International
- Ontario Centre for Materials Research
- Pavaco Plastics Inc.
- Protrans Design Team
- Queen's University
  - Department of Chemistry
- Queen's University
  - Department of Metallurgical Engineering
- Rockwell International of Canada Ltd.
- Ryerson Polytechnical Institute
  - Office of Research and Innovation
- Sambrook & Hermetz Industrial Designers
- Southern Alberta Institute of Technology
  - Auto-Diesel Department
- Spectrum Engineering Corporation Ltd.
- Steiko Inc.
- TES Limited
- Université Laval
  - CERSIM
- Université Laval
  - LIPAO, Department of Chemical Engineering
- University of Ottawa
- University of Ottawa
  - Electrochemical Science and Technology Centre
- University of Toronto
  - Department of Chemical Engineering and Applied Chemistry
- University of Toronto
  - Department of Chemical Engineering and Applied Chemistry
- University of Toronto
  - Department of Mechanical Engineering
- University of Toronto
  - Department of Metallurgy and Materials Science
- University of Toronto
  - Faculty of Applied Science and Engineering
- WEGU Canada Inc.
- Weir-Jones Engineering Consultants Ltd.

Composites

- Acustar Canada Inc.
  - Ajax Trim Division
- Annectron Engineering Inc.
- Biokinetics and Associates Ltd.
- Carleton University
- Carleton University
  - School of Industrial Design
- Centre de consultation et de formation en automatique et ordinique (CFAO)
- Centre de recherche industrielle du Québec (CRIQ)
- Composite Technological Materials Centre
- Concordia University
  - Department of Mechanical Engineering
- DSMA International Inc.
- Eberhard Hardware Manufacturing Limited
- École Polytechnique de Montréal
  - Centre de caractérisation microscopique des matériaux
- École Polytechnique de Montréal
  - Centre de recherche appliquée sur les polymères (CRASP)
- F.T. Gerson Limited
- Fiberglas Canada Inc.
- Gad Shaanan Designs Inc.
- Glos Engineering Ltd.
- Hoemsen & Associates
- Hydro-Québec
  - Laboratoire des technologies électrochimiques/électrotechniques
- IPL Inc.
- KTC Testing & Development Inc.
- Lakehead University
  - Department of Mechanical Engineering
- Long Manufacturing Ltd.
- MacLennan Associates
- Magna International
- Manufacturing Research Corporation of Ontario
- McGill University
  - Department of Mining and Metallurgical Engineering
- McMaster University
  - Department of Mechanical Engineering
- NARMCO National Auto Radiator Manufacturing Co.

Composites cont'd
National Institute of Magnesium Technology
National Optics Institute
National Research Council
  Environmental Protection Science
National Research Council
  Industrial Materials Research Institute
Northern Alberta Institute of Technology
ORTECH International
Ontario Centre for Materials Research
Pavaco Plastics Inc.
Protrans Design Team
Queen's University
  Department of Chemistry
Queen's University
  Department of Metallurgical Engineering
Rockwell International of Canada Ltd.
Ryerson Polytechnical Institute
  Office of Research and Innovation
Southern Alberta Institute of Technology
  Auto-Diesel Department
Spectrum Engineering Corporation Ltd.
Stelco Inc.
TES Limited
Technical University of Nova Scotia
  Department of Mechanical Engineering
The University of Western Ontario
  Surface Science Western
Uniroyal Goodrich
Université Laval
  CERSIM
Université Laval
  LIPAO, Department of Chemical Engineering
University of Ottawa
University of Ottawa
  Department of Mechanical Engineering
University of Ottawa
  Electrochemical Science and Technology Centre
University of Toronto
  Department of Chemical Engineering and Applied Chemistry
University of Toronto
  Department of Chemical Engineering and Applied Chemistry
University of Toronto
  Department of Mechanical Engineering
University of Toronto
  Department of Metallurgy and Materials Science
University of Toronto
  Faculty of Applied Science and Engineering
University of Toronto
  Institute of Aerospace Studies

Rubber and Elastomers

Acustar Canada Inc.
  Ajax Trim Division
Annectron Engineering Inc.
Biokinetics and Associates Ltd.
Carleton University
  School of Industrial Design
Centre de recherche industrielle du Québec (CRIQ)
Composite Technological Materials Centre
DSMA International Inc.
Eberhard Hardware Manufacturing Limited
École Polytechnique de Montréal
  Centre de caractérisation microscopique des matériaux
F.T. Gerson Limited
Gad Shaanan Designs Inc.
General Kinetics Engineering Corp.
Glos Engineering Ltd.
Goshen Rubber of Canada Limited
Hoemsen & Associates
IPL Inc.
KTC Testing & Development Inc.
Lakehead University
  Department of Mechanical Engineering
Long Manufacturing Ltd.
MacLennan Associates
McMaster University
  Institute for Polymer Production
National Research Council
  Environmental Protection Science
National Research Council
  Industrial Materials Research Institute
Northern Alberta Institute of Technology
ORTECH International
Pavaco Plastics Inc.
Protrans Design Team
Queen's University
  Department of Chemistry
Queen's University
  Department of Metallurgical Engineering
Rockwell International of Canada Ltd.
Ryerson Polytechnical Institute
  Office of Research and Innovation
Spectrum Engineering Corporation Ltd.
TES Limited
Uniroyal Goodrich
Université Laval
  LIPAO, Department of Chemical Engineering
University of Ottawa
University of Ottawa
  Electrochemical Science and Technology Centre
University of Toronto
  Department of Chemical Engineering and Applied Chemistry
University of Toronto
  Department of Chemical Engineering and Applied Chemistry
University of Toronto
  Faculty of Applied Science and Engineering
WEGU Canada Inc.

Glass

Biokinetics and Associates Ltd.
Carleton University
  School of Industrial Design
Centre de consultation et de formation en automatique
  et ordinique (CFAO)
Centre de recherche industrielle du Québec (CRIQ)
DSMA International Inc.
École Polytechnique de Montréal
École Polytechnique de Montréal
  Centre de caractérisation microscopique des matériaux
F.T. Gerson Limited
Fiberglas Canada Inc.
Gad Shaanan Designs Inc.
Glos Engineering Ltd.
Hoemsen & Associates
Lakehead University
  Department of Mechanical Engineering
Long Manufacturing Ltd.
MacLennan Associates
McMaster University
  Department of Mechanical Engineering
National Optics Institute
Northern Alberta Institute of Technology
ORTECH International
Protrans Design Team

Glass cont'd

- Queen's University
  - Department of Metallurgical Engineering
- Ryerson Polytechnical Institute
  - Office of Research and Innovation
- Spectrum Engineering Corporation Ltd.
- TES Limited
- The University of Western Ontario
  - Surface Science Western
- University of Ottawa
  - Electrochemical Science and Technology Centre
- University of Toronto
  - Department of Chemical Engineering and Applied Chemistry
- University of Toronto
  - Department of Chemical Engineering and Applied Chemistry
- University of Toronto
  - Faculty of Applied Science and Engineering

Electrical or Electronic Materials

- Annectron Engineering Inc.
- Biokinetics and Associates Ltd.
- CADMI Microelectronics/microélectronique Inc.
- Carleton University
  - School of Industrial Design
- Centre de consultation et de formation en automatique et ordinique (CFAO)
- Centre de recherche industrielle du Québec (CRIQ)
- Centre spécialisé de technologie physique
- Command Start Inc.
- DBM Reflex Entreprise Inc.
- DSMA International Inc.
- Eberhard Hardware Manufacturing Limited
- École Polytechnique de Montréal
- École Polytechnique de Montréal
  - Centre de caractérisation microscopique des matériaux
- F.T. Gerson Limited
- Gad Shaanan Designs Inc.
- General Kinetics Engineering Corp.
- Global Sensor Systems Inc.
- Glos Engineering Ltd.
- Hoemsen & Associates
- Holland College Technology Centre
- Hydro-Québec
  - Laboratoire des technologies électrochimiques/électrotechniques
- Hydro-Québec Research Institute
- Institut d'ordinique du Québec
- KTC Testing & Development Inc.
- Lakehead University
  - Department of Mechanical Engineering
- Long Manufacturing Ltd.
- MacLennan Associates
- Manufacturing Research Corporation of Ontario
- McMaster University
  - Department of Mechanical Engineering
- National Institute of Magnesium Technology
- National Research Council
  - Environmental Protection Science
- Northern Alberta Institute of Technology
- ORTECH International
- Ontario Centre for Materials Research
- Rockwell International of Canada Ltd.
- Ryerson Polytechnical Institute
  - Office of Research and Innovation
- Southern Alberta Institute of Technology
  - Auto-Diesel Department
- Spectrum Engineering Corporation Ltd.
- TES Limited
- University of Ottawa
- University of Ottawa
  - Electrochemical Science and Technology Centre
- University of Toronto
  - Department of Chemical Engineering and Applied Chemistry
- University of Toronto
  - Department of Metallurgy and Materials Science
- University of Toronto
  - Faculty of Applied Science and Engineering
- Vancouver Community College
  - Career Division
- W.R. Davis Engineering Limited
- Weir-Jones Engineering Consultants Ltd.

Finishes and Coatings

- Annectron Engineering Inc.
- Biokinetics and Associates Ltd.
- Carleton University
  - School of Industrial Design
- Centre de recherche industrielle du Québec (CRIQ)
- DSMA International Inc.
- Eberhard Hardware Manufacturing Limited
- École Polytechnique de Montréal
  - Centre de caractérisation microscopique des matériaux
- F.T. Gerson Limited
- Gad Shaanan Designs Inc.
- General Kinetics Engineering Corp.
- Glos Engineering Ltd.
- Hoemsen & Associates
- IPL Inc.
- Ingersoll-Rand Canada Inc.
  - Torrington Division
- KTC Testing & Development Inc.
- Long Manufacturing Ltd.
- METCOR Inc.
- MacLennan Associates
- Magna International
- NARMCO National Auto Radiator Manufacturing Co.
- National Institute of Magnesium Technology
- National Research Council
  - Environmental Protection Science
- National Research Council
  - Industrial Materials Research Institute
- Northern Alberta Institute of Technology
- ORTECH International
- Ontario Centre for Materials Research
- Protrans Design Team
- Queen's University
  - Department of Metallurgical Engineering
- Rockwell International of Canada Ltd.
- Ryerson Polytechnical Institute
  - Office of Research and Innovation
- Southern Alberta Institute of Technology
  - Auto-Diesel Department
- Spectrum Engineering Corporation Ltd.
- Stelco Inc.
- TAVA Corporation
- TES Limited
- The University of Western Ontario
  - Surface Science Western
- Université Laval
  - Department of Mechanical Engineering
- University of Ottawa
  - Electrochemical Science and Technology Centre
- University of Toronto
  - Department of Chemical Engineering and Applied Chemistry
- University of Toronto
  - Department of Chemical Engineering and Applied Chemistry

Finishes and Coatings cont'd
University of Toronto
  Department of Mechanical Engineering
University of Toronto
  Faculty of Applied Science and Engineering
Vancouver Community College
  Career Division
W.R. Davis Engineering Limited

Noise and Vibration

Acustar Canada Inc.
  Ajax Trim Division
Annectron Engineering Inc.
Biokinetics and Associates Ltd.
Carleton University
Carleton University
  School of Industrial Design
Cartech Consulting Services
Centre de consultation et de formation en automatique
  et ordinique (CFAO)
Centre de recherche industrielle du Québec (CRIQ)
Concordia University
  CONCAVE Research Centre
Concordia University
  Department of Mechanical Engineering
DSMA International Inc.
Eberhard Hardware Manufacturing Limited
École Polytechnique de Montréal
Gad Shaanan Designs Inc.
Gates Power Drive Products Inc.
General Kinetics Engineering Corp.
Glos Engineering Ltd.
Hematite Manufacturing
Hoemsen & Associates
KTC Testing & Development Inc.
Lakehead University
  Department of Mechanical Engineering
Long Manufacturing Ltd.
MacLennan Associates
Magna International
Manufacturing Research Corporation of Ontario
McMaster University
  Department of Mechanical Engineering
NARMCO National Auto Radiator Manufacturing Co.
National Institute of Magnesium Technology
Northern Alberta Institute of Technology
ORTECH International
Pavaco Plastics Inc.
Queen's University
  Department of Mechanical Engineering
Rockwell International of Canada Ltd.
Ryerson Polytechnical Institute
  Office of Research and Innovation
Siemens Automotive Ltd.
  Induction/Cooling Division
Spectrum Engineering Corporation Ltd.
Stelco Inc.
TES Limited
Technical University of Nova Scotia
  Department of Mechanical Engineering
Uniroyal Goodrich
Université de Sherbrooke
  Acoustics Group (GAUS)
University of Ottawa
University of Ottawa
  Electrochemical Science and Technology Centre
University of Toronto
  Department of Chemical Engineering and Applied Chemistry
University of Toronto
  Faculty of Applied Science and Engineering
University of Toronto
  Institute of Aerospace Studies
W.R. Davis Engineering Limited
Weir-Jones Engineering Consultants Ltd.
Wilson, Dario & Associates

Simulation and Modelling

Annectron Engineering Inc.
Biokinetics and Associates Ltd.
CADMI Microelectronics/microélectronique Inc.
Canadian Institute of Industrial Technology
  Division of Electrical Engineering
Carleton University
Carleton University
  School of Industrial Design
Centre de consultation et de formation en automatique
  et ordinique (CFAO)
Centre de recherche industrielle du Québec (CRIQ)
Composite Technological Materials Centre
Concordia University
  CONCAVE Research Centre
Concordia University
  Department of Mechanical Engineering
DBM Reflex Entreprise Inc.
DSMA International Inc.
Eberhard Hardware Manufacturing Limited
École Polytechnique de Montréal
F.T. Gerson Limited
Forming Technologies Incorporated
Gad Shaanan Designs Inc.
Gates Power Drive Products Inc.
General Kinetics Engineering Corp.
Glos Engineering Ltd.
Hawtal Whiting of Canada Ltd.
Hoemsen & Associates
IPL Inc.
Ingersoll-Rand Canada Inc.
  Torrington Division
KTC Testing & Development Inc.
Lakehead University
  Department of Mechanical Engineering
Long Manufacturing Ltd.
MacLennan Associates
Manufacturing Research Corporation of Ontario
McGill University
  CSIRA Steel Processing Laboratory
McMaster University
  Centre for Flexible Manufacturing Research and Development
McMaster University
  Department of Mechanical Engineering
McMaster University
  Institute for Polymer Production
National Institute of Magnesium Technology
National Research Council
  Industrial Materials Research Institute
Northern Alberta Institute of Technology
ORTECH International
Ontario Centre for Materials Research
Pavaco Plastics Inc.
Protrans Design Team
Queen's University
  Department of Mechanical Engineering
Queen's University
  Department of Metallurgical Engineering
Rockwell International of Canada Ltd.

Simulation and Modelling cont'd

Ryerson Polytechnical Institute
  Office of Research and Innovation
Sambrook & Hermetz Industrial Designers
Siemens Automotive Ltd.
  Induction/Cooling Division
Simon Fraser University
  School of Engineering Science
Southern Alberta Institute of Technology
  Auto-Diesel Department
Spectrum Engineering Corporation Ltd.
Stelco Inc.
TES Limited
The University of British Columbia
  Department of Mechanical Engineering
Université Laval
  Department of Mechanical Engineering
Université Laval
  LIPAO, Department of Chemical Engineering
University of Ottawa
University of Ottawa
  Electrochemical Science and Technology Centre
University of Toronto
  Department of Chemical Engineering and Applied Chemistry
University of Toronto
  Department of Chemical Engineering and Applied Chemistry
University of Toronto
  Department of Mechanical Engineering
University of Toronto
  Department of Metallurgy and Materials Science
University of Toronto
  Faculty of Applied Science and Engineering
W.R. Davis Engineering Limited
Weir-Jones Engineering Consultants Ltd.

Stress, Strain, Stiffness

Annectron Engineering Inc.
Biokinetics and Associates Ltd.
Carleton University
Carleton University
  School of Industrial Design
Centre de consultation et de formation en automatique
  et ordinique (CFAO)
Centre de recherche industrielle du Québec (CRIQ)
Concordia University
  CONCAVE Research Centre
DSMA International Inc.
Eberhard Hardware Manufacturing Limited
École Polytechnique de Montréal
  Centre de caractérisation microscopique des matériaux
F.T. Gerson Limited
Forming Technologies Incorporated
Gates Power Drive Products Inc.
General Kinetics Engineering Corp.
Glos Engineering Ltd.
Hawtal Whiting of Canada Ltd.
Hoemsen & Associates
KTC Testing & Development Inc.
Lakehead University
  Department of Mechanical Engineering
Long Manufacturing Ltd.
METCOR Inc.
MacLennan Associates
Magna International
Manufacturing Research Corporation of Ontario
McMaster University
  Centre for Flexible Manufacturing Research and Development
McMaster University
  Department of Mechanical Engineering
National Institute of Magnesium Technology
National Optics Institute
National Research Council
  Industrial Materials Research Institute
Northern Alberta Institute of Technology
ORTECH International
Ontario Centre for Materials Research
Queen's University
  Department of Mechanical Engineering
Queen's University
  Department of Metallurgical Engineering
Rockwell International of Canada Ltd.
Ryerson Polytechnical Institute
  Office of Research and Innovation
Siemens Automotive Ltd.
  Induction/Cooling Division
Spectrum Engineering Corporation Ltd.
Stelco Inc.
TES Limited
Technical University of Nova Scotia
  Department of Mechanical Engineering
Uniroyal Goodrich
University of Ottawa
University of Ottawa
  Electrochemical Science and Technology Centre
University of Toronto
  Department of Chemical Engineering and Applied Chemistry
University of Toronto
  Department of Chemical Engineering and Applied Chemistry
University of Toronto
  Department of Mechanical Engineering
University of Toronto
  Department of Metallurgy and Materials Science
University of Toronto
  Department of Mechanical Engineering, Robotics and
  Automation Laboratory
University of Toronto
  Faculty of Applied Science and Engineering
W.R. Davis Engineering Limited
Weir-Jones Engineering Consultants Ltd.

Systems Integration

Annectron Engineering Inc.
Biokinetics and Associates Ltd.
Canadian Institute of Industrial Technology
  Division of Electrical Engineering
Carleton University
Carleton University
  School of Industrial Design
Cartech Consulting Services
Centre de consultation et de formation en automatique
  et ordinique (CFAO)
Centre de recherche industrielle du Québec (CRIQ)
Centre spécialisé de technologie physique
DSMA International Inc.
Eberhard Hardware Manufacturing Limited
F.T. Gerson Limited
Gates Power Drive Products Inc.
Glos Engineering Ltd.
Hoemsen & Associates
Lakehead University
  Department of Mechanical Engineering
Long Manufacturing Ltd.
MacLennan Associates
Manufacturing Research Corporation of Ontario

Systems Integration cont'd

- McMaster University
  - Centre for Flexible Manufacturing Research and Development
- McMaster University
  - Department of Mechanical Engineering
- National Institute of Magnesium Technology
- National Research Council
  - Industrial Materials Research Institute
- Northern Alberta Institute of Technology
- ORTECH International
- Protrans Design Team
- Queen's University
  - Department of Mechanical Engineering
- Rockwell International of Canada Ltd.
- Ryerson Polytechnical Institute
  - Office of Research and Innovation
- SKD Company
- Siemens Automotive Ltd.
  - Induction/Cooling Division
- Spectrum Engineering Corporation Ltd.
- Stelco Inc.
- TES Limited
- University of Ottawa
- University of Ottawa
  - Electrochemical Science and Technology Centre
- University of Toronto
  - Department of Chemical Engineering and Applied Chemistry
- University of Toronto
  - Department of Chemical Engineering and Applied Chemistry
- University of Toronto
  - Department of Mechanical Engineering, Robotics and Automation Laboratory
- University of Toronto
  - Faculty of Applied Science and Engineering
- W.R. Davis Engineering Limited
- Weir-Jones Engineering Consultants Ltd.

Other Expertise Reported

- F.E.L. Consultants Limited
- F.T. Gerson Limited
- Forensic Engineering
- Hugh Macmillan Rehabilitation Centre
  - Rehabilitation Engineering
- KTC Testing & Development Inc.
- MacLennan Associates
- McGill University
  - Department of Mining and Metallurgical Engineering
- Northern Alberta Institute of Technology
- Pavaco Plastics Inc.
- TAVA Corporation
- University of Ottawa
- University of Ottawa
  - Electrochemical Science and Technology Centre

Automotive Component Specialty

Body and Structure

- Annectron Engineering Inc.
- Biokinetics and Associates Ltd.
- Cartech Consulting Services
- Centre de consultation et de formation en automatique et ordinique (CFAO)
- Centre de recherche industrielle du Québec (CRIQ)
- Composite Technological Materials Centre
- Concordia University
  - Department of Mechanical Engineering
- DSMA International Inc.
- Diffracto Limited
- École Polytechnique de Montréal
  - Centre de caractérisation microscopique des matériaux
- École Polytechnique de Montréal
  - Centre de recherche appliquée sur les polymères (CRASP)
- F.T. Gerson Limited
- Fiberglas Canada Inc.
- Forming Technologies Incorporated
- Gad Shaanan Designs Inc.
- Hawtal Whiting of Canada Ltd.
- Hoemsen & Associates
- IPL Inc.
- KTC Testing & Development Inc.
- KVB Manufacturing
- Lakehead University
  - Department of Mechanical Engineering
- Long Manufacturing Ltd.
- MacLennan Associates
- Magna International
- McMaster University
  - Centre for Flexible Manufacturing Research and Development
- NARMCO National Auto Radiator Manufacturing Co.
- National Research Council
  - Industrial Materials Research Institute
- Northern Alberta Institute of Technology
- ORTECH International
- Pavaco Plastics Inc.
- Protrans Design Team
- Queen's University
  - Department of Mechanical Engineering
- Rockwell International of Canada Ltd.
- Ryerson Polytechnical Institute
  - Office of Research and Innovation
- SKD Company
- Sensor Adaptive Machines Inc. (SAMI)
- Spectrum Engineering Corporation Ltd.
- TES Limited
- The University of Western Ontario
  - Surface Science Western
- Transport Canada
  - Motor Vehicle Test Centre
- University of Ottawa
- University of Ottawa
  - Electrochemical Science and Technology Centre
- University of Toronto
  - Department of Chemical Engineering and Applied Chemistry
- University of Toronto
  - Department of Mechanical Engineering
- University of Toronto
  - Faculty of Applied Science and Engineering
- W.R. Davis Engineering Limited
- WEGU Canada Inc.
- Weir-Jones Engineering Consultants Ltd.

Electrical System

- Annectron Engineering Inc.
- Biokinetics and Associates Ltd.
- CADMI Microelectronics/microélectronique Inc.
- Centre de consultation et de formation en automatique et ordinique (CFAO)
- Centre de recherche industrielle du Québec (CRIQ)
- Centre spécialisé de technologie physique
- Command Start Inc.
- Concordia University
  - Department of Mechanical Engineering
- DBM Reflex Entreprise Inc.
- DSMA International Inc.
- F.T. Gerson Limited

Electrical System cont'd

- Hawtal Whiting of Canada Ltd.
- Hoemsen & Associates
- Holland College Technology Centre
- Hydro-Québec
  - Laboratoire des technologies électrochimiques/électrotechniques
- Hydro-Québec Research Institute
- IPL Inc.
- Institut d'ordinique du Québec
- KTC Testing & Development Inc.
- KVB Manufacturing
- Lakehead University
  - Department of Mechanical Engineering
- MacLennan Associates
- Magna International
- National Research Council
  - Industrial Materials Research Institute
- Northern Alberta Institute of Technology
- ORTECH International
- Ryerson Polytechnical Institute
  - Office of Research and Innovation
- Société de Microélectronique Industrielle de Sherbrooke Inc.
- Spectrum Engineering Corporation Ltd.
- TES Limited
- The University of British Columbia
  - Department of Electrical Engineering
- The University of Western Ontario
  - Surface Science Western
- University of Ottawa
- University of Ottawa
  - Electrochemical Science and Technology Centre
- University of Toronto
  - Department of Chemical Engineering and Applied Chemistry
- University of Toronto
  - Department of Electrical Engineering, VLSI Research Group
- University of Toronto
  - Department of Mechanical Engineering, Robotics and Automation Laboratory
- University of Toronto
  - Faculty of Applied Science and Engineering
- W.R. Davis Engineering Limited
- Weir-Jones Engineering Consultants Ltd.

Engines

- Biokinetics and Associates Ltd.
- Cartech Consulting Services
- Centre de recherche industrielle du Québec (CRIQ)
- Concordia University
  - Department of Mechanical Engineering
- DSMA International Inc.
- Environment Canada
  - Vehicle Emissions Test Laboratory
- F.T. Gerson Limited
- Goshen Rubber of Canada Limited
- Hoemsen & Associates
- Ingenious Devices Ltd.
- KTC Testing & Development Inc.
- Lakehead University
  - Department of Mechanical Engineering
- Long Manufacturing Ltd.
- METCOR Inc.
- MacLennan Associates
- Magna International
- NARMCO National Auto Radiator Manufacturing Co.
- Northern Alberta Institute of Technology
- ORTECH International
- Queen's University
  - Department of Mechanical Engineering
- Ryerson Polytechnical Institute
  - Office of Research and Innovation
- Sensor Adaptive Machines Inc. (SAMI)
- Simon Fraser University
  - School of Engineering Science
- Southern Alberta Institute of Technology
  - Auto-Diesel Department
- Spectrum Engineering Corporation Ltd.
- TES Limited
- Technical University of Nova Scotia
  - Department of Mechanical Engineering
- The University of British Columbia
  - Department of Mechanical Engineering
- Thermotech Engineering
- Transport Canada
  - Motor Vehicle Test Centre
- University of Ottawa
- University of Ottawa
  - Department of Mechanical Engineering
- University of Ottawa
  - Electrochemical Science and Technology Centre
- University of Toronto
  - Department of Chemical Engineering and Applied Chemistry
- University of Toronto
  - Department of Chemical Engineering and Applied Chemistry
- University of Toronto
  - Department of Mechanical Engineering, Engine R&D Laboratory
- University of Toronto
  - Faculty of Applied Science and Engineering
- Vancouver Community College
  - Career Division
- W.R. Davis Engineering Limited
- Wilson, Dario & Associates

Emission Control Systems

- Centre de recherche industrielle du Québec (CRIQ)
- DSMA International Inc.
- Environment Canada
  - Vehicle Emissions Test Laboratory
- F.T. Gerson Limited
- KTC Testing & Development Inc.
- Lakehead University
  - Department of Mechanical Engineering
- MacLennan Associates
- Northern Alberta Institute of Technology
- ORTECH International
- Ryerson Polytechnical Institute
  - Office of Research and Innovation
- Spectrum Engineering Corporation Ltd.
- TES Limited
- Technical University of Nova Scotia
  - Department of Mechanical Engineering
- The University of British Columbia
  - Department of Mechanical Engineering
- Thermotech Engineering
- Transport Canada
  - Motor Vehicle Test Centre
- University of Ottawa
- University of Ottawa
  - Electrochemical Science and Technology Centre
- University of Toronto
  - Department of Chemical Engineering and Applied Chemistry
- University of Toronto
  - Department of Chemical Engineering and Applied Chemistry
- University of Toronto
  - Department of Mechanical Engineering, Engine R&D Laboratory

Emission Control Systems cont'd

- University of Toronto
  - Faculty of Applied Science and Engineering
- Vancouver Community College
  - Career Division
- W.R. Davis Engineering Limited

Heating, Ventilating and Air Conditioning

- Annectron Engineering Inc.
- Biokinetics and Associates Ltd.
- CADMI Microelectronics/microélectronique Inc.
- Centre de consultation et de formation en automatique et ordinique (CFAO)
- Centre de recherche industrielle du Québec (CRIQ)
- DSMA International Inc.
- F.T. Gerson Limited
- Glos Engineering Ltd.
- Goshen Rubber of Canada Limited
- Hawtal Whiting of Canada Ltd.
- IPL Inc.
- KTC Testing & Development Inc.
- Long Manufacturing Ltd.
- MacLennan Associates
- Northern Alberta Institute of Technology
- ORTECH International
- Pavaco Plastics Inc.
- Queen's University
  - Department of Mechanical Engineering
- Ryerson Polytechnical Institute
  - Office of Research and Innovation
- Siemens Automotive Ltd.
  - Induction/Cooling Division
- Southern Alberta Institute of Technology
  - Auto-Diesel Department
- Spectrum Engineering Corporation Ltd.
- TES Limited
- Technical University of Nova Scotia
  - Department of Mechanical Engineering
- University of Ottawa
- University of Ottawa
  - Electrochemical Science and Technology Centre
- University of Toronto
  - Department of Chemical Engineering and Applied Chemistry
- University of Toronto
  - Department of Chemical Engineering and Applied Chemistry
- University of Toronto
  - Faculty of Applied Science and Engineering
- W.R. Davis Engineering Limited
- Wilson, Dario & Associates

Instruments and Controls

- Annectron Engineering Inc.
- Biokinetics and Associates Ltd.
- CADMI Microelectronics/microélectronique Inc.
- Cartech Consulting Services
- Centre de consultation et de formation en automatique et ordinique (CFAO)
- Centre de recherche industrielle du Québec (CRIQ)
- Concordia University
  - Department of Mechanical Engineering
- DSMA International Inc.
- F.T. Gerson Limited
- Gad Shaanan Designs Inc.
- Glos Engineering Ltd.
- Hoemsen & Associates
- KTC Testing & Development Inc.
- KVB Manufacturing
- Lakehead University
  - Department of Mechanical Engineering
- Long Manufacturing Ltd.
- MacLennan Associates
- National Optics Institute
- National Research Council
  - Industrial Materials Research Institute
- Northern Alberta Institute of Technology
- ORTECH International
- Ryerson Polytechnical Institute
  - Office of Research and Innovation
- Sambrook & Hermetz Industrial Designers
- Spectrum Engineering Corporation Ltd.
- TES Limited
- The University of British Columbia
  - Department of Electrical Engineering
- Transport Canada
  - Motor Vehicle Test Centre
- University of Ottawa
- University of Ottawa
  - Electrochemical Science and Technology Centre
- University of Toronto
  - Department of Chemical Engineering and Applied Chemistry
- University of Toronto
  - Department of Mechanical Engineering, Robotics and Automation Laboratory
- University of Toronto
  - Faculty of Applied Science and Engineering
- W.R. Davis Engineering Limited
- Weir-Jones Engineering Consultants Ltd.

Interior Trim and Components

- Annectron Engineering Inc.
- Biokinetics and Associates Ltd.
- Canadian General-Tower Limited
- Carleton University
  - School of Industrial Design
- Centre de consultation et de formation en automatique et ordinique (CFAO)
- Centre de recherche industrielle du Québec (CRIQ)
- Composite Technological Materials Centre
- DBM Reflex Entreprise Inc.
- DSMA International Inc.
- F.T. Gerson Limited
- Gad Shaanan Designs Inc.
- Glos Engineering Ltd.
- Hawtal Whiting of Canada Ltd.
- Hematite Manufacturing
- IPL Inc.
- KTC Testing & Development Inc.
- MacLennan Associates
- Magna International
- National Research Council
  - Industrial Materials Research Institute
- Northern Alberta Institute of Technology
- ORTECH International
- Pavaco Plastics Inc.
- Protrans Design Team
- Rockwell International of Canada Ltd.
- Ryerson Polytechnical Institute
  - Office of Research and Innovation
- Spectrum Engineering Corporation Ltd.
- TES Limited
- Université Laval
  - Department of Mechanical Engineering
- University of Ottawa
  - Electrochemical Science and Technology Centre

Interior Trim and Components cont'd

University of Toronto
  Department of Chemical Engineering and Applied Chemistry
University of Toronto
  Department of Chemical Engineering and Applied Chemistry
University of Toronto
  Faculty of Applied Science and Engineering

Steering, Suspension, Brakes

Biokinetics and Associates Ltd.
Cartech Consulting Services
Centre de recherche industrielle du Québec (CRIQ)
Concordia University
  CONCAVE Research Centre
Concordia University
  Department of Mechanical Engineering
DSMA International Inc.
F.T. Gerson Limited
General Kinetics Engineering Corp.
Goshen Rubber of Canada Limited
Hawtal Whiting of Canada Ltd.
KTC Testing & Development Inc.
KVB Manufacturing
Lakehead University
  Department of Mechanical Engineering
Long Manufacturing Ltd.
METCOR Inc.
MacLennan Associates
Northern Alberta Institute of Technology
ORTECH International
Queen's University
  Department of Mechanical Engineering
Ryerson Polytechnical Institute
  Office of Research and Innovation
SKD Company
Sensor Adaptive Machines Inc. (SAMI)
Southern Alberta Institute of Technology
  Auto-Diesel Department
Spectrum Engineering Corporation Ltd.
TES Limited
Transport Canada
  Motor Vehicle Test Centre
University of Ottawa
University of Ottawa
  Electrochemical Science and Technology Centre
University of Toronto
  Department of Chemical Engineering and Applied Chemistry
University of Toronto
  Faculty of Applied Science and Engineering
Vancouver Community College
  Career Division
Vehicle Systems Development Corp.
W.R. Davis Engineering Limited
WEGU Canada Inc.
Weir-Jones Engineering Consultants Ltd.

Transmissions

Biokinetics and Associates Ltd.
Cartech Consulting Services
Centre de recherche industrielle du Québec (CRIQ)
DSMA International Inc.
F.T. Gerson Limited
Gates Power Drive Products Inc.
Goshen Rubber of Canada Limited
Hoemsen & Associates
Hydro-Québec Research Institute
Ingersoll-Rand Canada Inc.
  Torrington Division
KTC Testing & Development Inc.
Lakehead University
  Department of Mechanical Engineering
Long Manufacturing Ltd.
METCOR Inc.
MacLennan Associates
Magna International
NARMCO National Auto Radiator Manufacturing Co.
Northern Alberta Institute of Technology
ORTECH International
Queen's University
  Department of Mechanical Engineering
Ryerson Polytechnical Institute
  Office of Research and Innovation
Sensor Adaptive Machines Inc. (SAMI)
Southern Alberta Institute of Technology
  Auto-Diesel Department
Spectrum Engineering Corporation Ltd.
TES Limited
University of Ottawa
University of Ottawa
  Electrochemical Science and Technology Centre
University of Toronto
  Department of Chemical Engineering and Applied Chemistry
University of Toronto
  Department of Mechanical Engineering, Robotics and
  Automation Laboratory
University of Toronto
  Faculty of Applied Science and Engineering
Vancouver Community College
  Career Division
Vehicle Systems Development Corp.
W.R. Davis Engineering Limited

Safety Systems or Components

Annectron Engineering Inc.
Biokinetics and Associates Ltd.
Centre de consultation et de formation en automatique
  et ordinique (CFAO)
Centre de recherche industrielle du Québec (CRIQ)
Concordia University
  CONCAVE Research Centre
DSMA International Inc.
Defence and Civil Institute of Environmental Medicine
  Biodynamics Group
F.T. Gerson Limited
Global Sensor Systems Inc.
Hawtal Whiting of Canada Ltd.
Hoemsen & Associates
KTC Testing & Development Inc.
KVB Manufacturing
Lakehead University
  Department of Mechanical Engineering
MacLennan Associates
National Optics Institute
Northern Alberta Institute of Technology
ORTECH International
Queen's University
  Department of Mechanical Engineering
Rockwell International of Canada Ltd.
Ryerson Polytechnical Institute
  Office of Research and Innovation
Spectrum Engineering Corporation Ltd.
TES Limited
Transport Canada
  Motor Vehicle Test Centre
University of Ottawa

Safety Systems or Components cont'd

University of Ottawa
  Electrochemical Science and Technology Centre
University of Toronto
  Department of Chemical Engineering and Applied Chemistry
University of Toronto
  Department of Chemical Engineering and Applied Chemistry
University of Toronto
  Faculty of Applied Science and Engineering
Vehicle Systems Development Corp.
W.R. Davis Engineering Limited
Weir-Jones Engineering Consultants Ltd.

Wheels or Tires

Biokinetics and Associates Ltd.
Cartech Consulting Services
Centre de recherche industrielle du Québec (CRIQ)
Concordia University
  CONCAVE Research Centre
DSMA International Inc.
F.T. Gerson Limited
Hawtal Whiting of Canada Ltd.
Hoemsen & Associates
KTC Testing & Development Inc.
MacLennan Associates
Northern Alberta Institute of Technology
ORTECH International
Ryerson Polytechnical Institute
  Office of Research and Innovation
Spectrum Engineering Corporation Ltd.
TES Limited
Transport Canada
  Motor Vehicle Test Centre
Uniroyal Goodrich
Université Laval
  Department of Mechanical Engineering
University of Ottawa
  Electrochemical Science and Technology Centre
University of Toronto
  Department of Chemical Engineering and Applied Chemistry
University of Toronto
  Faculty of Applied Science and Engineering
Vehicle Systems Development Corp.
W.R. Davis Engineering Limited

Diagnostic or Service Equipment

CADMI Microelectronics/microélectronique Inc.
Centre de consultation et de formation en automatique et ordinique (CFAO)
Centre de recherche industrielle du Québec (CRIQ)
DSMA International Inc.
École Polytechnique de Montréal
École Polytechnique de Montréal
  Centre de caractérisation microscopique des matériaux
F.T. Gerson Limited
KTC Testing & Development Inc.
Northern Alberta Institute of Technology
Simon Fraser University
  School of Engineering Science
Spectrum Engineering Corporation Ltd.
TES Limited
Université Laval
  Department of Mechanical Engineering
University of Ottawa
University of Ottawa
  Electrochemical Science and Technology Centre
University of Toronto
  Department of Chemical Engineering and Applied Chemistry
University of Toronto
  Faculty of Applied Science and Engineering
Weir-Jones Engineering Consultants Ltd.

Industry, Science and Technology Canada
Industrie, Sciences et Technologie Canada